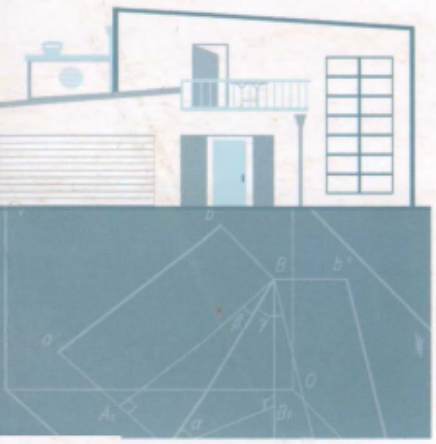
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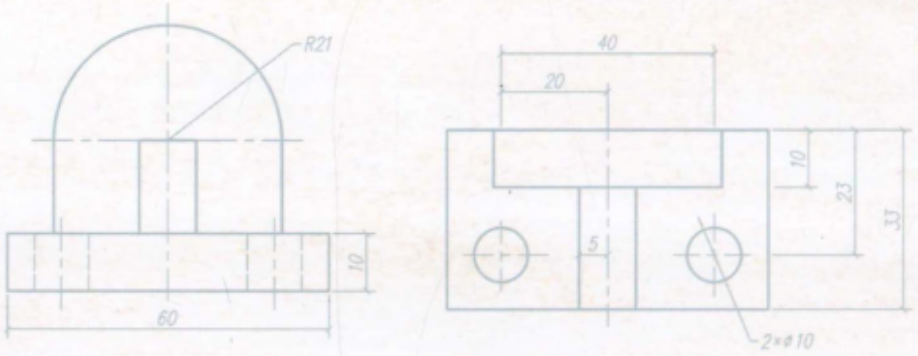


画法几何与工程制图基础习题集

DESCRIPTIVE GEOMETRY AND ENGINEERING GRAPHICS FOUNDATION EXERCISES

（学科基础课适用）

远 方 主编
戴丽荣 王养军 尹建忠 李 斌 编



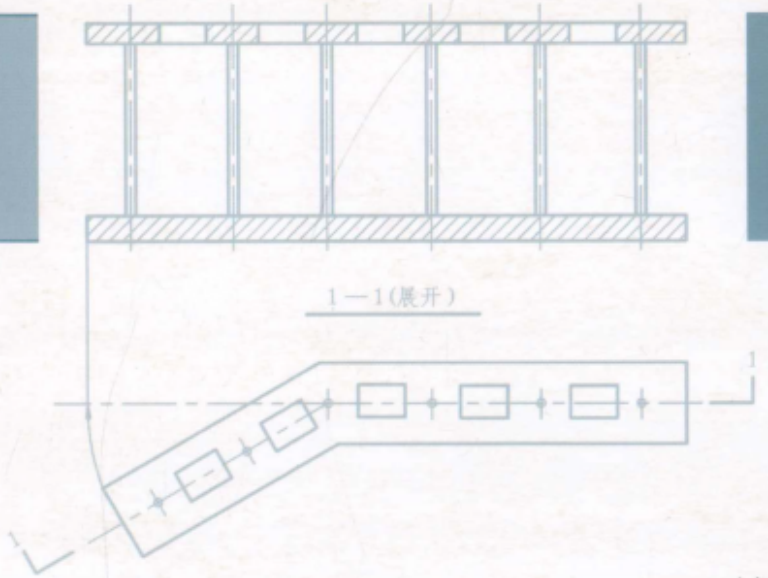
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内 容 提 要

本习题集与《画法几何与工程制图基础》配套使用。本套教材以教育部高等学校工程图学教学指导委员会2010年制订的《普通高等学校工程图学课程教学基本要求》和国家相关制图标准为依据，并结合多年来土木工程制图课教改经验成果编写而成。

全书共分为九章，其中第1章至第5章为画法几何基础理论部分，该部分以点、线、面和体的投影为主线由浅入深、由易到难逐次展开；第6章组合体视图、第7章剖面图和断面图、第8章轴测图和第9章标高投影为制图应用基础部分，该部分内容相对独立，读者可根据需要与基础理论部分搭配学习。

本套教材可作为高等院校土木工程类各专业和非土木工程类专业土木工程制图的教学教材，也可作为继续教育相关专业的自学教材或参考资料。

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前　言

本习题集与同时出版的《画法几何与工程制图基础》配套使用。

本套教材以教育部高等学校工程图学教学指导委员会2010年制订的《普通高等学校工程图学课程教学基本要求》和GB/T 50001—2010《房屋建筑制图统一标准》、GB/T 50103—2010《总图制图标准》、GB/T 50104—2010《建筑制图标准》、GB/T 50105—2010《建筑结构制图标准》以及其他相关国家标准为依据，并结合多年来土木工程制图课教改经验成果编写而成。

在编写指导思想上着重两点：一是保持画法几何的学科体系完整性（第1章至第5章），通过循序渐进地理论学习，培养学生的空间问题逻辑分析能力，为进一步工程制图的应用奠定坚实基础；二是总结提炼土木工程中各专业工程图的共性部分，形成独立模块（第6章组合体视图、第7章剖面图和断面图、第8章轴测图和第9章标高投影），土木工程各专业可根据需要与画法几何的基础理论部分搭配选用。

为适应新时期教学课程学时不断减少的现实情况，本套教材按照事物的认识规律组织学习内容，由浅入深、由易到难、由简至繁，科学组织安排前后章节，剔除不必要的枝节部分，力求使学生在较短时间内掌握工程图的读绘方法，具备基本的读绘能力。

本套教材可作为高等院校土木工程类各专业和非土木工程类专业土木工程制图的教学教材，也可作为继续教育相关专业的自学教材或参考资料。

参加本套教材编写的有：天津大学尹建忠（第1章、第6章）、戴丽荣（第2章、第9章）、王养军（第3章、第8章）、李斌（第4章、第7章）和远方（第5章）。

由于作者水平有限，本套教材中难免存在缺点和错误，在此恳请读者批评指正。

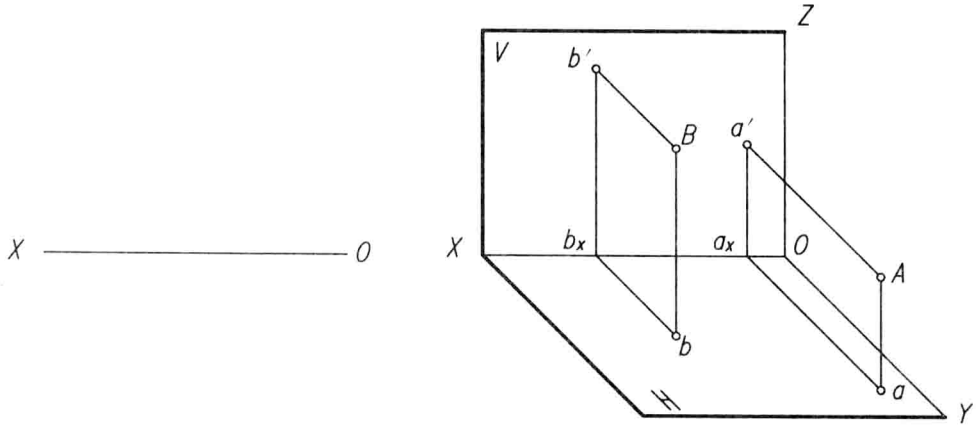
编者

2014年4月

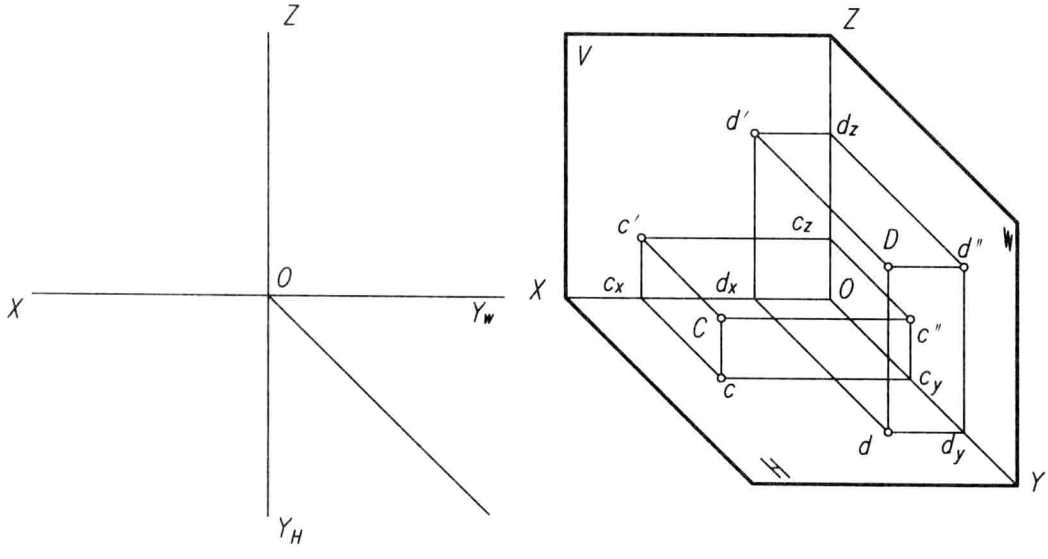
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1-1 已知两面体系中各点的空间位置，试作出其投影图。



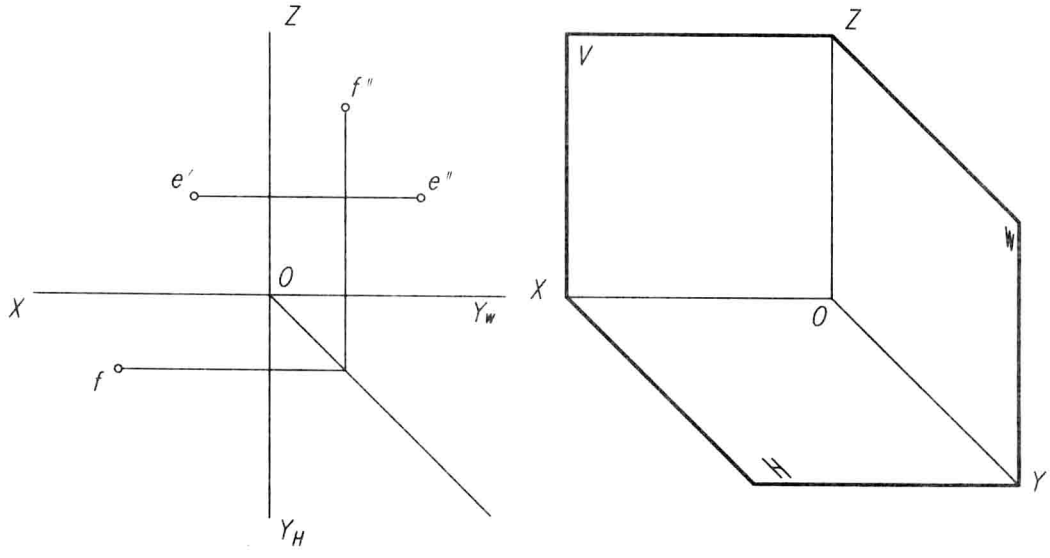
1-2 根据立体图画出C、D两点的三面投影。



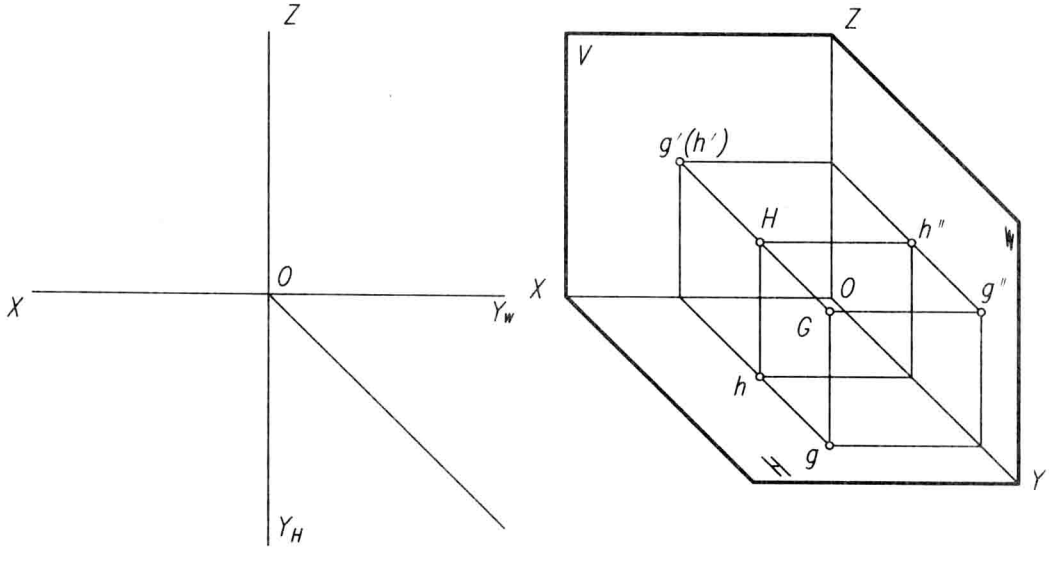
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1-3 已知E、F两点的两投影，试求第三投影，并作出其立体图。



1-4 画出V面重影点G、H的三面投影，并区分可见性。

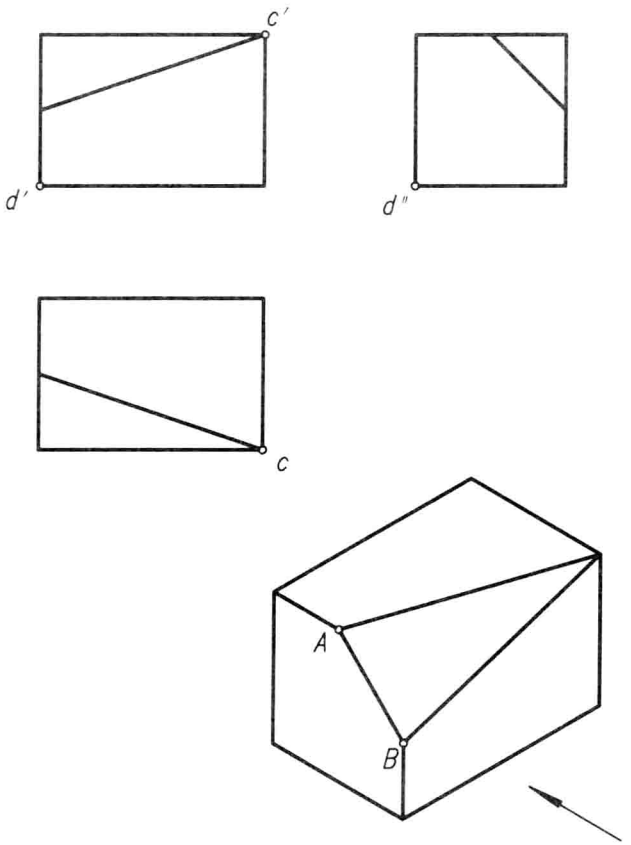


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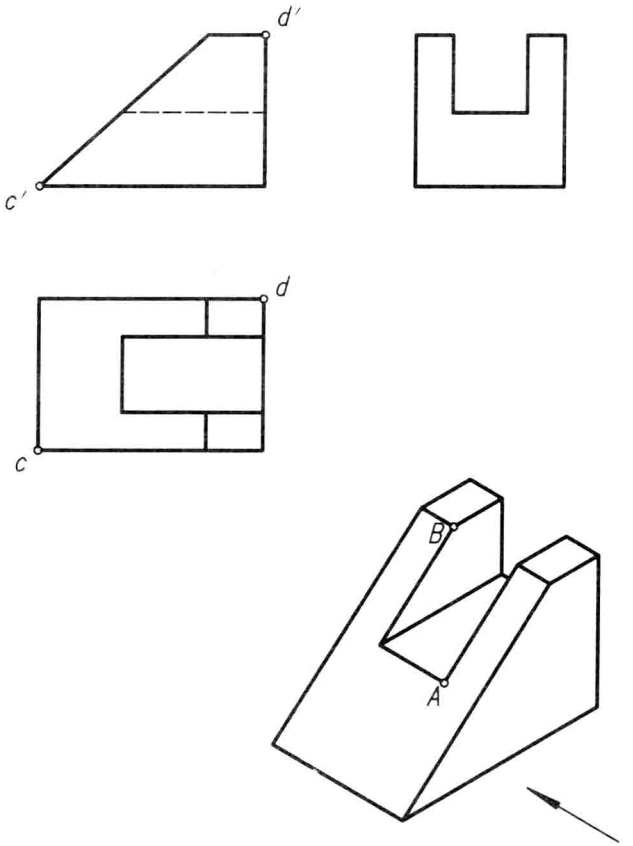
姓名

1-5 在形体的三视图上，标出A、B两点的投影位置，补全C、D两点所缺投影，并在立体图上标出C、D两点的位置。

(1)

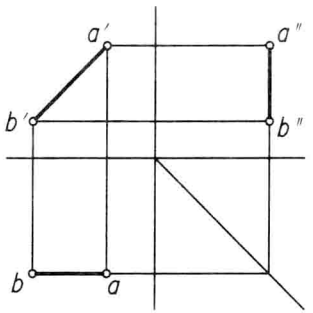


(2)



2-1 已知直线的两面投影，求第三投影，并判断直线的空间位置、填注直线的名称以及反映实长的投影（参照第(1)小题）。

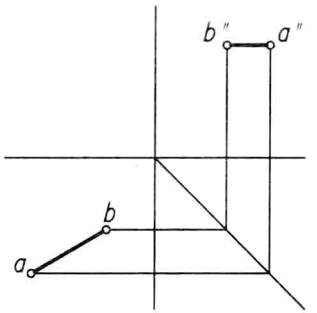
(1)



与V面 平行 与H面 相交 与W面 相交

AB是 正平 线　　实长投影：a′b′

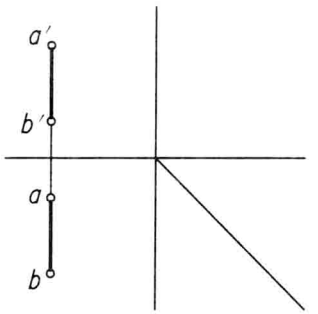
(2)



与V面 ____ 与H面 ____ 与W面 ____

AB是 ____ 线　　实长投影：____

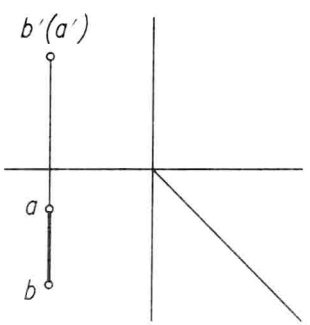
(3)



与V面 ____ 与H面 ____ 与W面 ____

AB是 ____ 线　　实长投影：____

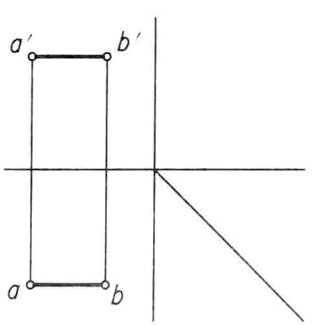
(4)



与V面 ____ 与H面 ____ 与W面 ____

AB是 ____ 线　　实长投影：____

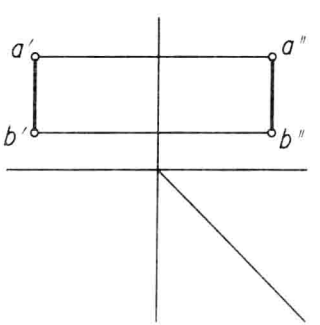
(5)



与V面 ____ 与H面 ____ 与W面 ____

AB是 ____ 线　　实长投影：____

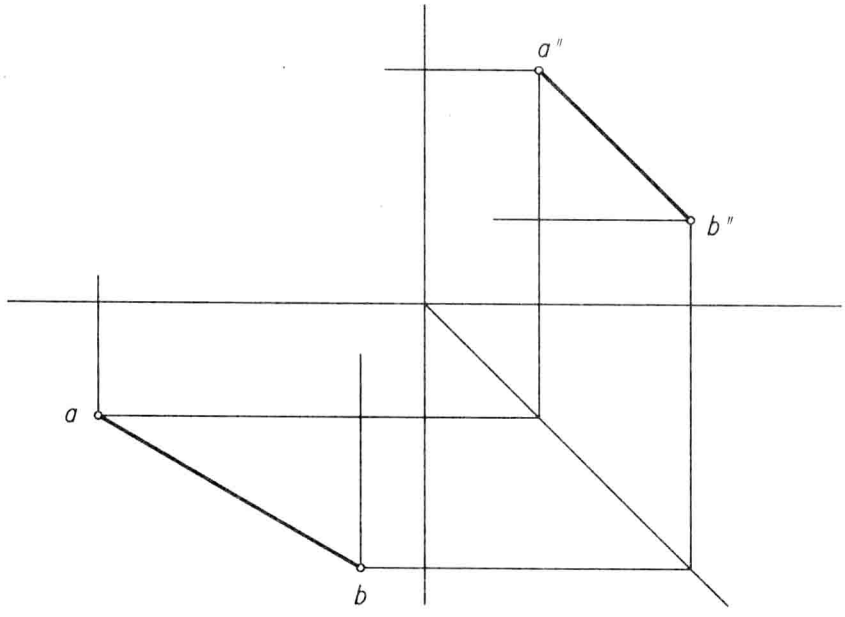
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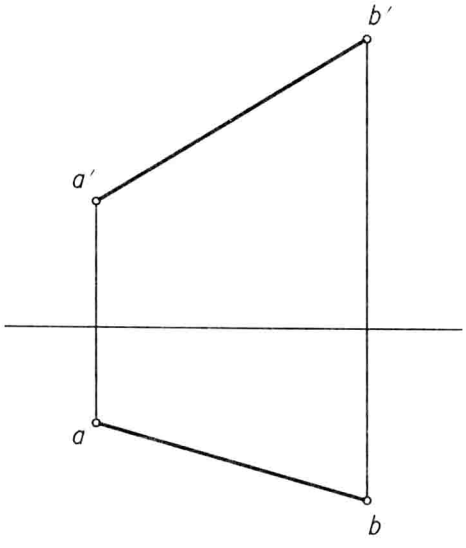
与V面 ____ 与H面 ____ 与W面 ____

AB是 ____ 线　　实长投影：____

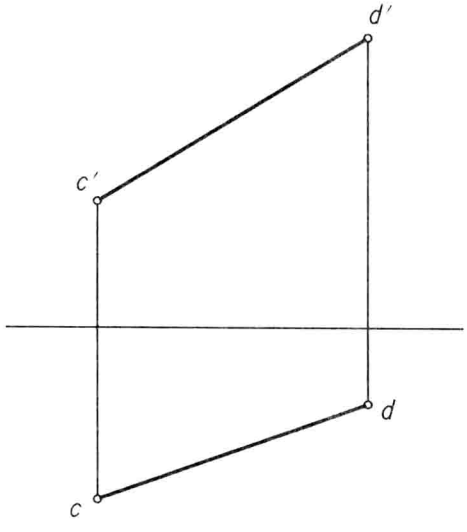
2-2 求线段*AB*的*V*面投影、线段*AB*的实长和α角。



2-3 在线段*AB*上定一点*K*，使其距*H*面30 mm。



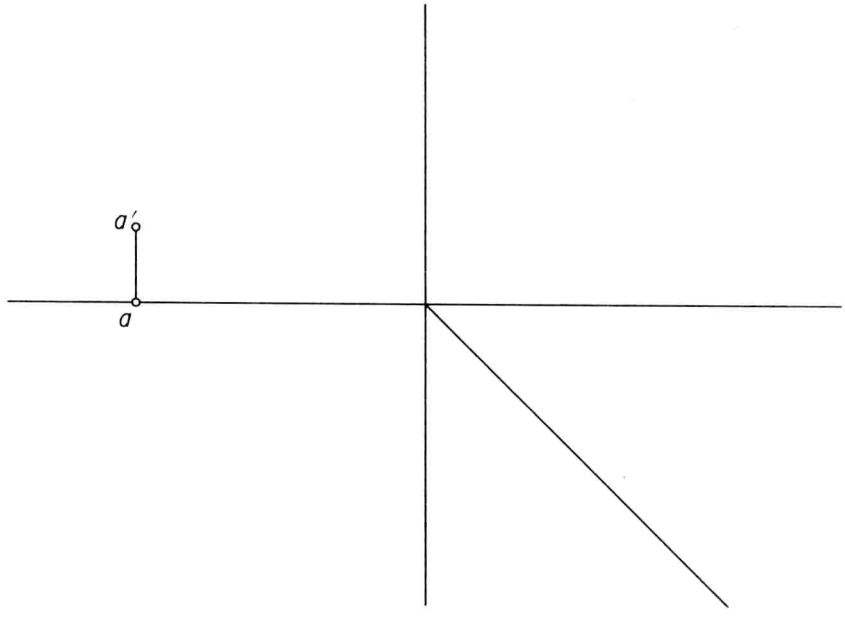
2-4 在线段*CD*上定一点*K*，使*CK*∶*KD*=4∶3。



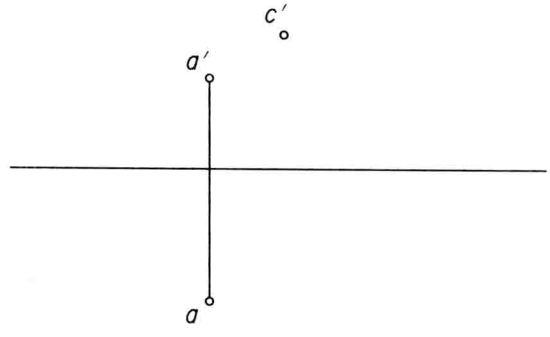
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2-5 已知直线*AB*上 *A* 点的两面投影，且*B*点在*W*面上，*y*坐标为25，与*H*面的夹角为30°，完成直线*AB*的三面投影。



2-6 已知直线*AB*上*A*点的两面投影，*C*点在*AB*线上，且分线段*AB*为*AC*∶*CB*=2∶3，直线*AB*的水平迹点距*OX*轴10 mm，补画直线*AB*的投影。

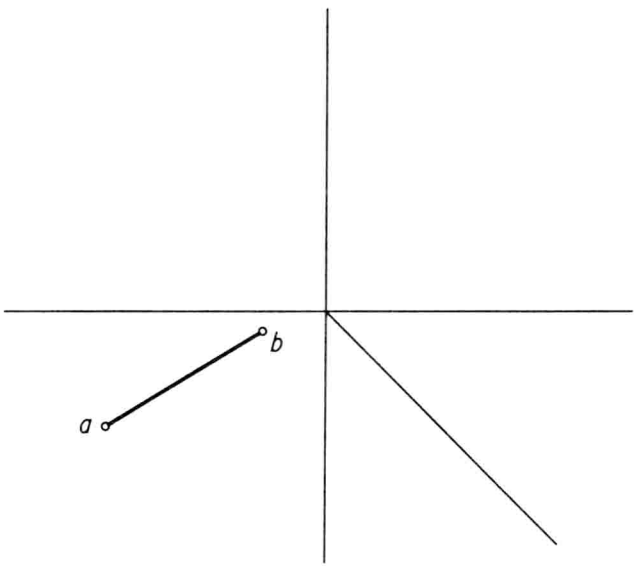


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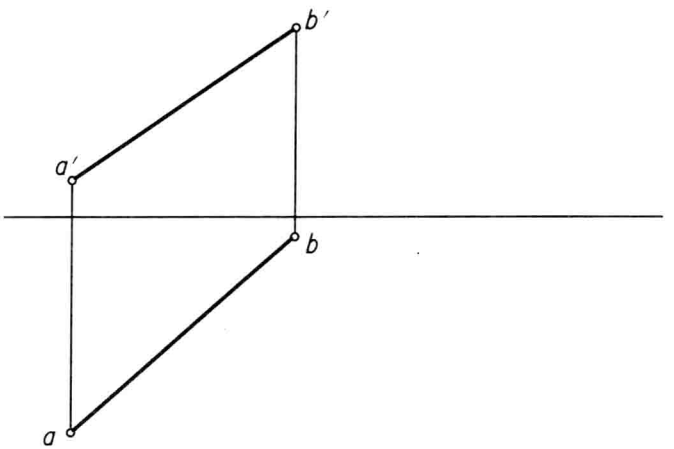
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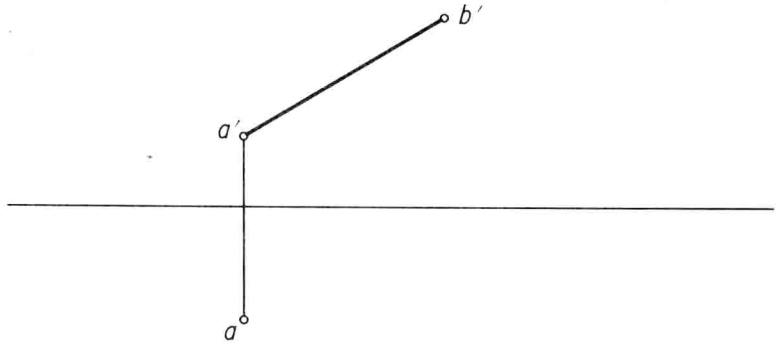
2-7 已知直线*AB*的水平投影及*A*点到*H*面的距离为10，*B*点到*H*面的距离为25，求*AB*线的*V*、*W*面投影及实长和α角。



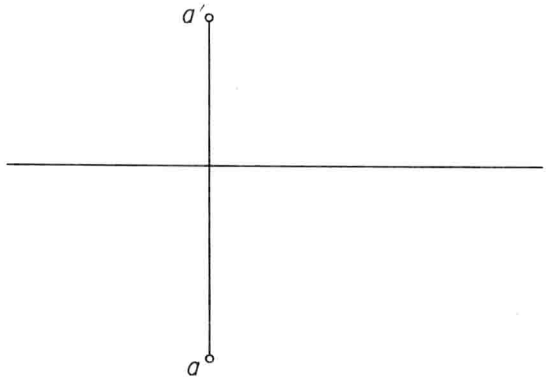
2-8 求直线*AB*的水平迹点和正面迹点，并在*AB*线段上定出一点*K*，使其与*H*、*V*面等距离。



2-9 已知线段AB对H面的倾角$\alpha=30°$，求其水平投影，并在其上定出一点C，使$AC:BC=2:3$。



2-10 已知直线AB的实长为30 mm，对H面倾角为30°，对V面倾角为45°，求其V、H面投影。（有几种解？）

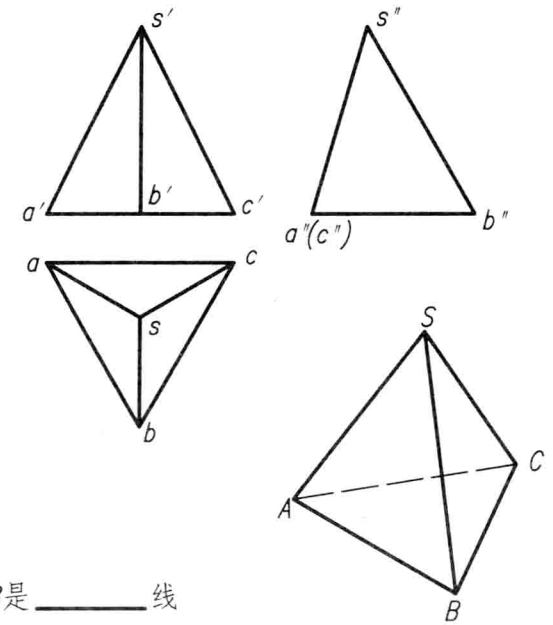


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2-11 已知三棱锥的三面投影，判断各条棱线是什么位置直线。



AB是_____线

AC是_____线

BC是_____线

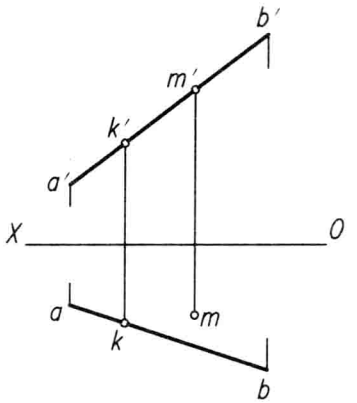
SA是_____线

SB是_____线

SC是_____线

2-12 判断K、M点是否在直线AB上。

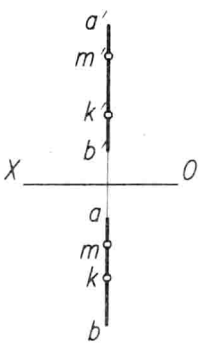
(1)



K点____AB上

M点____AB上

(2)



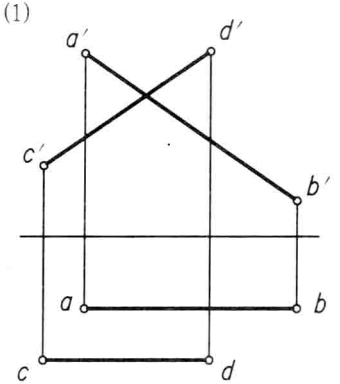
K点____AB上

M点____AB上

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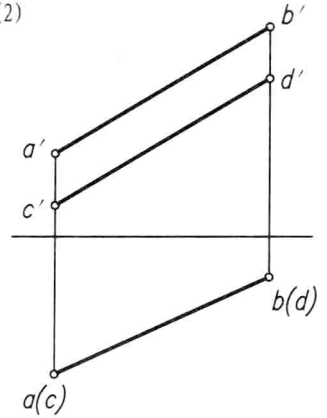
2-13 判断下列两直线的相对位置关系（平行、相交、异面、相交垂直、异面垂直）。

(1)



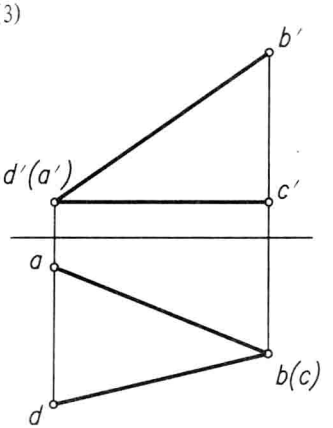
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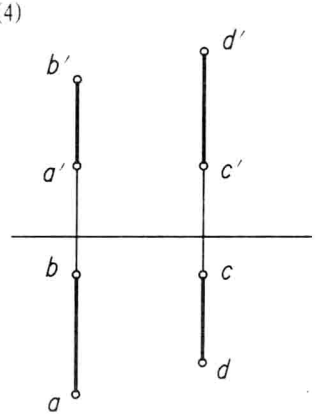
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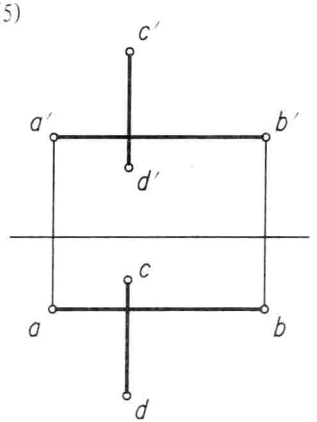
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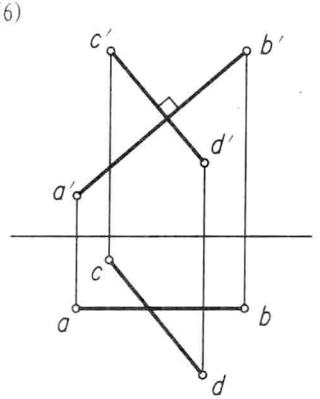
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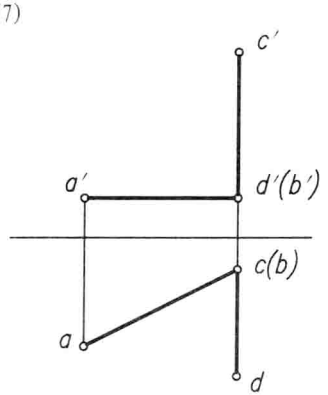
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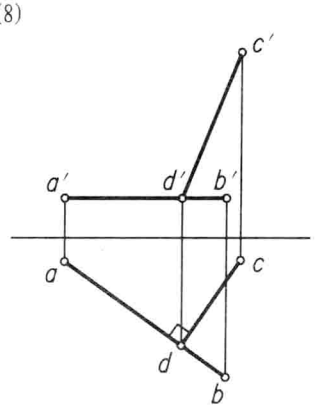
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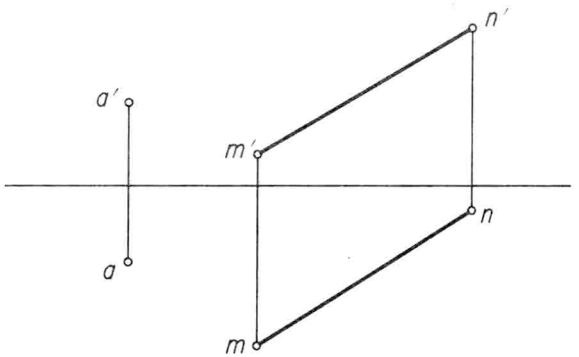
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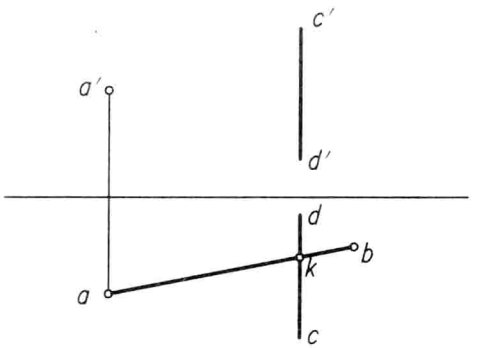


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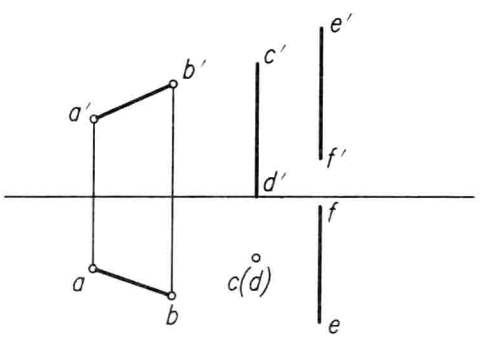
2-14 过*A*点分别作水平线和正平线与直线*MN*相交。



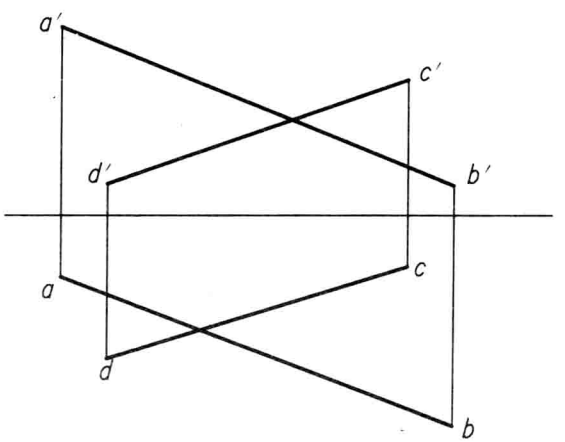
2-15 已知直线*AB*、*CD*相交于*K*点，求直线*AB*的正面投影。



2-16 作直线*MN*，使其与直线*AB*平行，并与直线*CD*、*EF*相交。

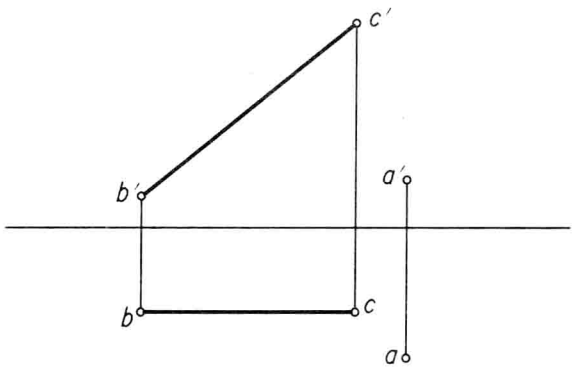


2-17 作出直线*AB*、*CD*重影点的两面投影，并判断可见性。

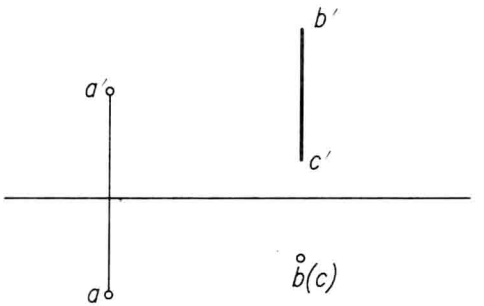


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2-18 过*A*点作直线与直线*BC*垂直相交，并求点*A*到直线*BC*的距离。



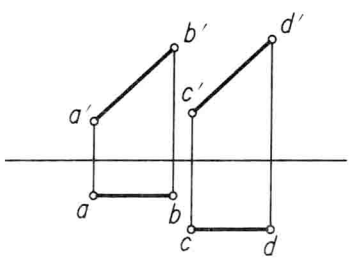
2-19 过*A*点作直线与直线*BC*垂直相交，判断此直线段相对投影面是什么位置的直线，投影是否反映实长。



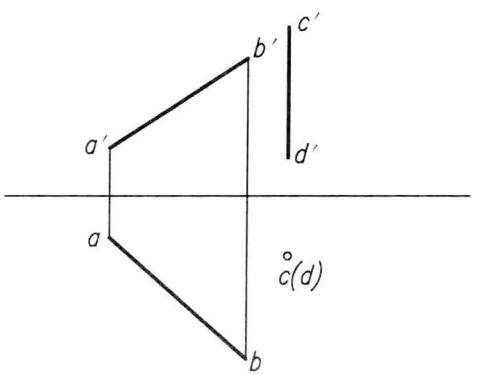
直线

实长

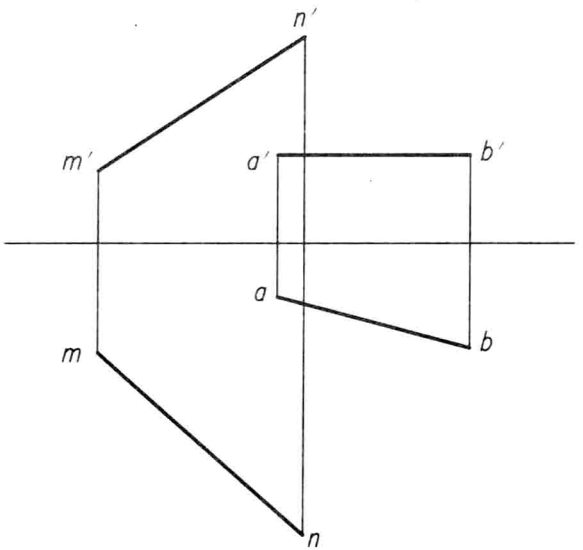
2-20 求两平行线间的距离。



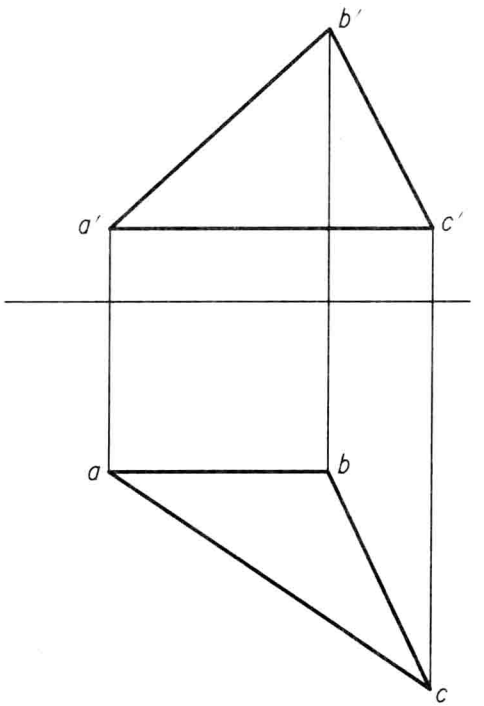
2-21 求作交叉两直线的最短距离。



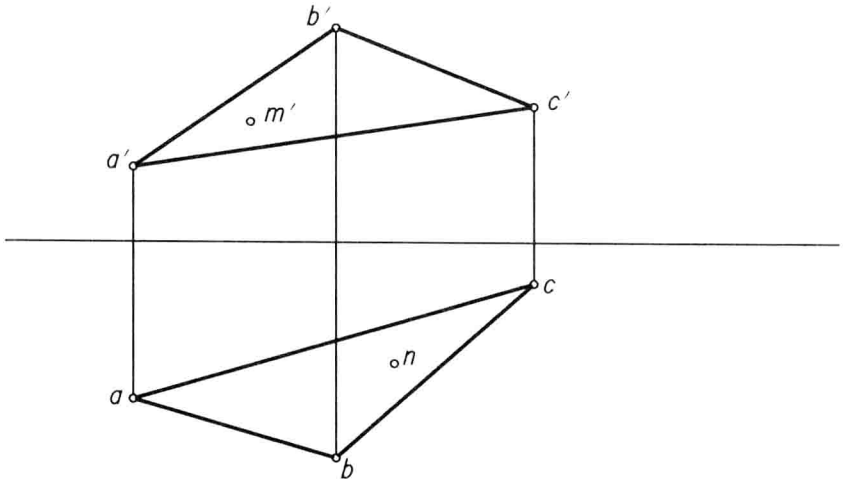
2-22 *AB*为矩形*ABCD*的一边，顶点*D*在直线*MN*上，求作该矩形的两面投影。



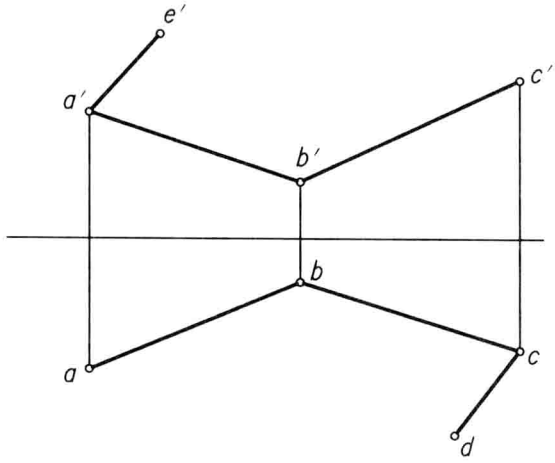
2-23 求平面*ABC*的垂心及*A*点到*BC*边的距离和平面*ABC*的实形。



2-24 已知*M*、*N*两点在平面*ABC*上，补出所缺*m*、*n*′。



2-25 完成平面多边形*ABCDE*的两面投影。



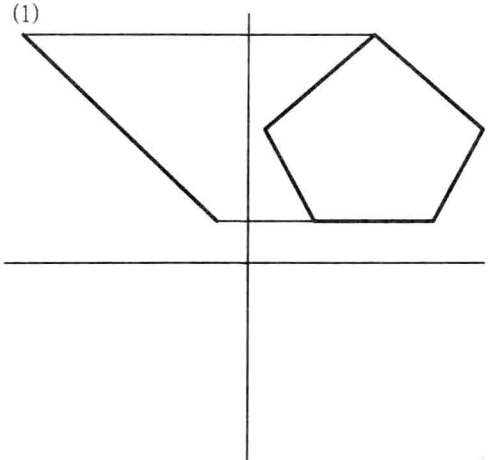
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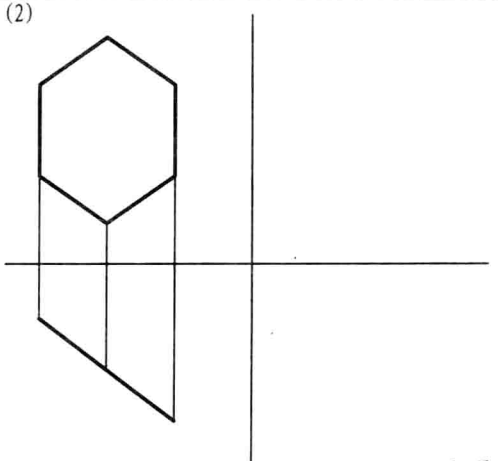
2-26 由所给平面的两面投影判断其是何种平面，并画出第三投影。

(1)



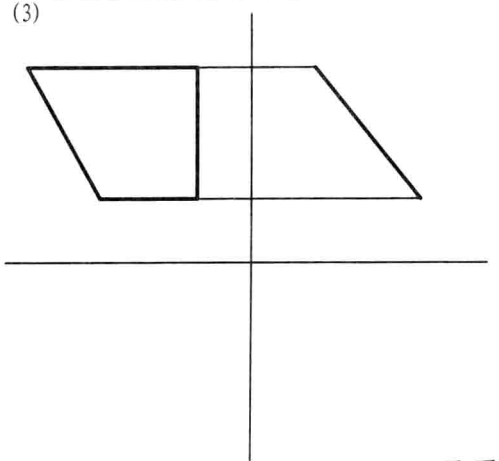
_____平面

(2)



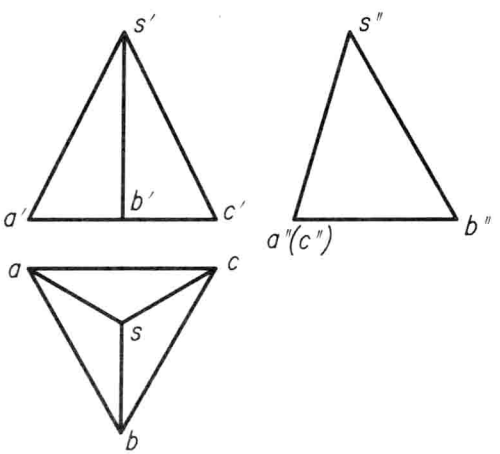
_____平面

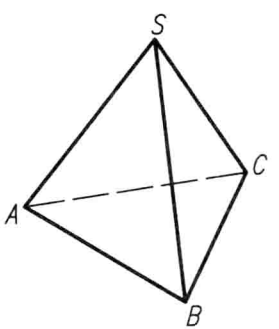
(3)



_____平面

2-27 已知三棱锥的三面投影，判断各棱面及底面是什么位置平面。





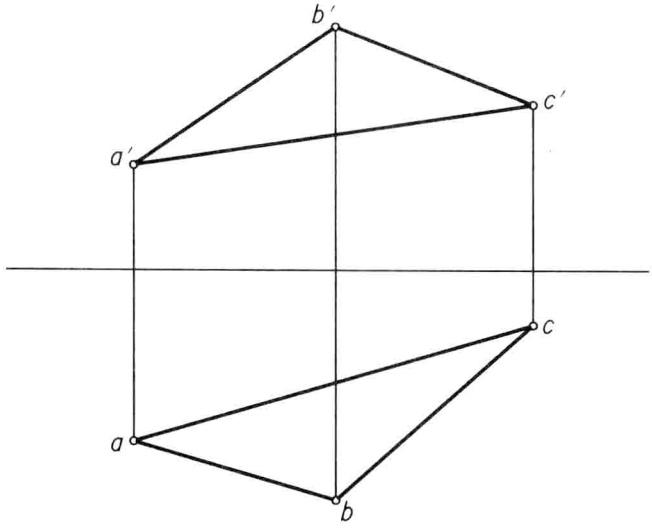
△ *ABC*是 _____ 面

△ *SAB*是 _____ 面

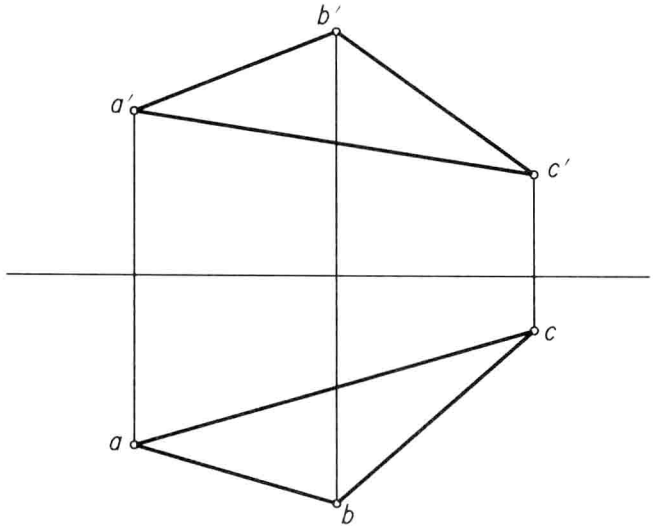
△ *SBC*是 _____ 面

△ *SCA*是 _____ 面

2-28 在△*ABC*内求作与*H*、*V*面的距离均为25的点*D*的投影。



2-29 在△*ABC*内作一水平线*AD*，使其实长为30，同时作出该平面对*H*面的最大斜度线*BE*，*E*点在直线*AC*上。

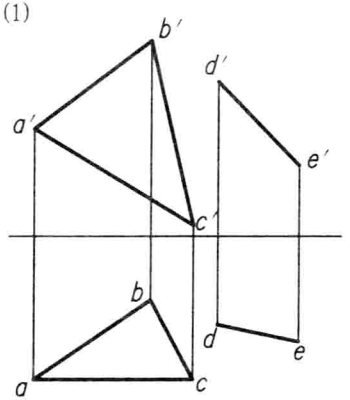


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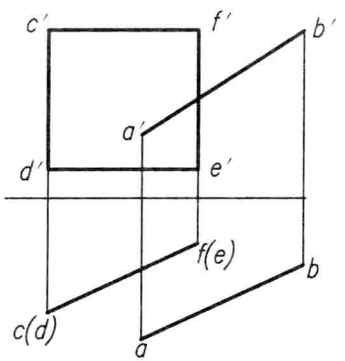
2-30 判断直线与平面、平面与平面是否平行。

(1)



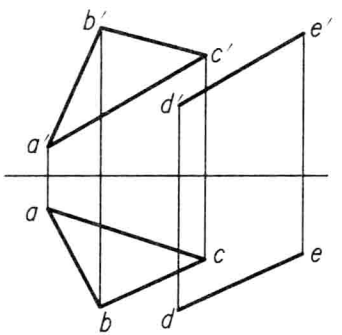
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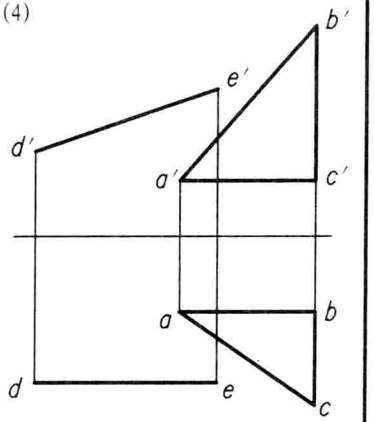
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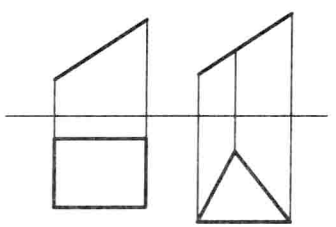
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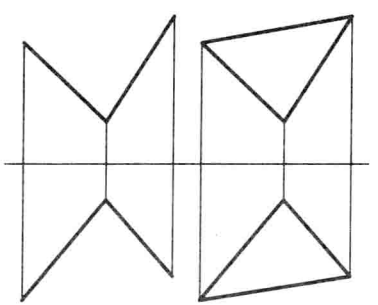
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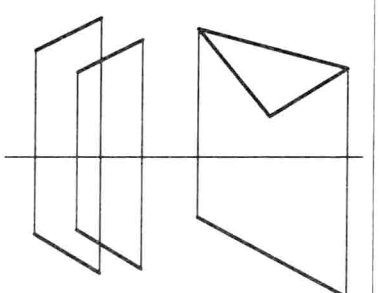
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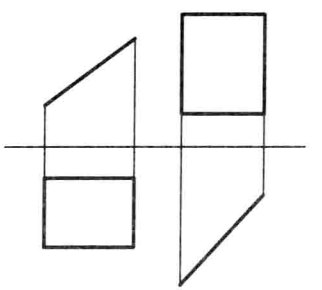
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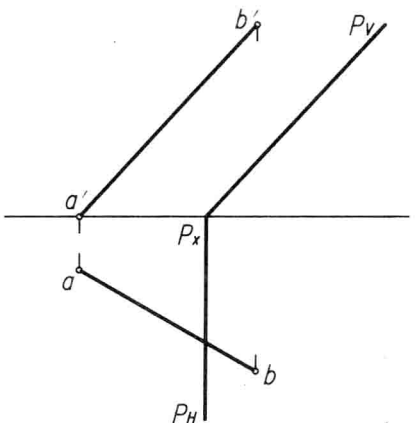


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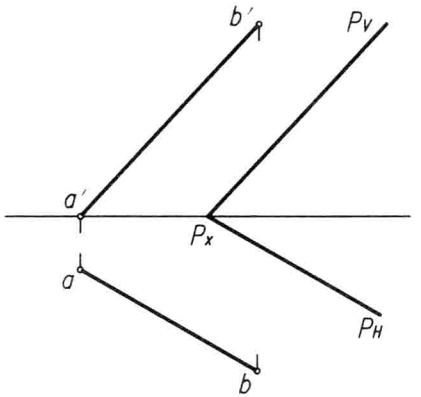
2-31 判断直线与平面、平面与平面是否平行。

(1)



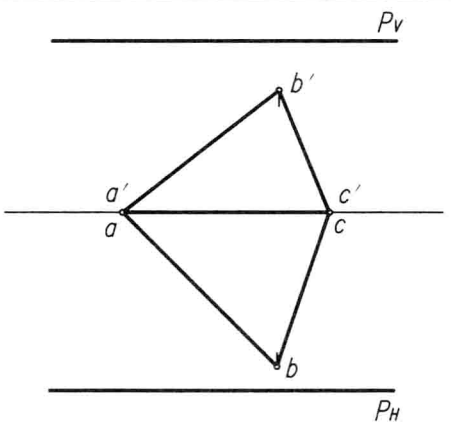
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(2)



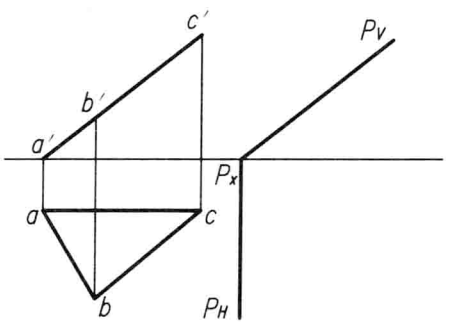
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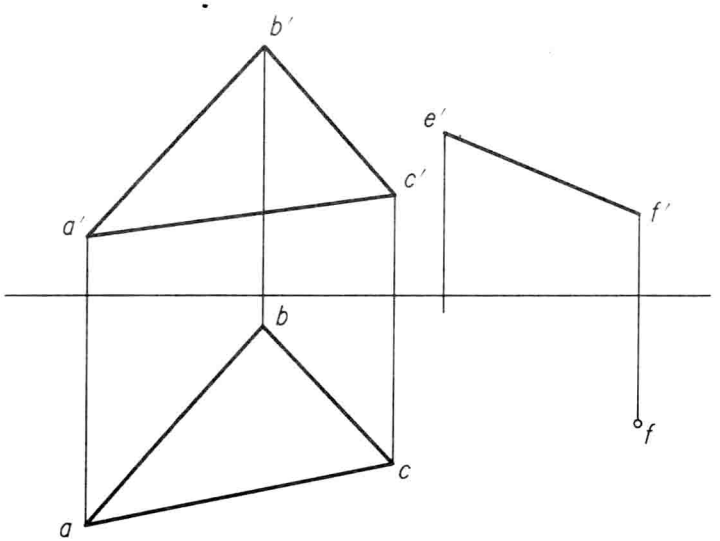
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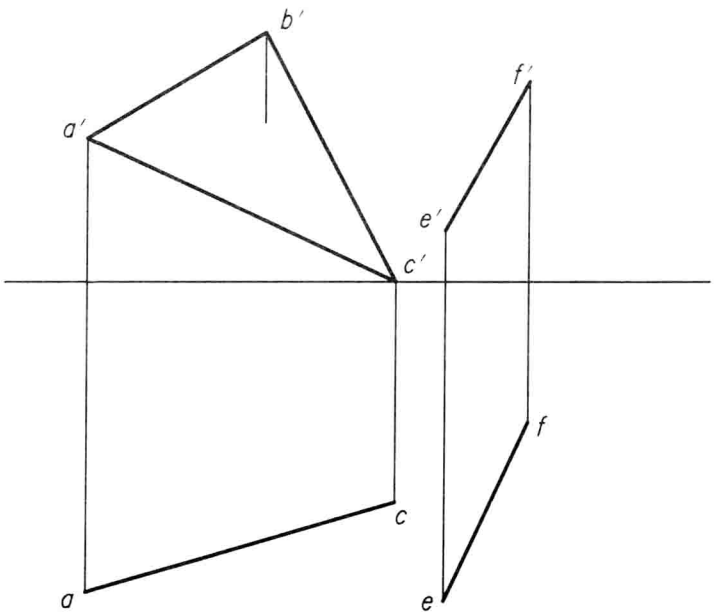


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2-32 直线*EF*与△*ABC*平行，补全其*H*面投影。

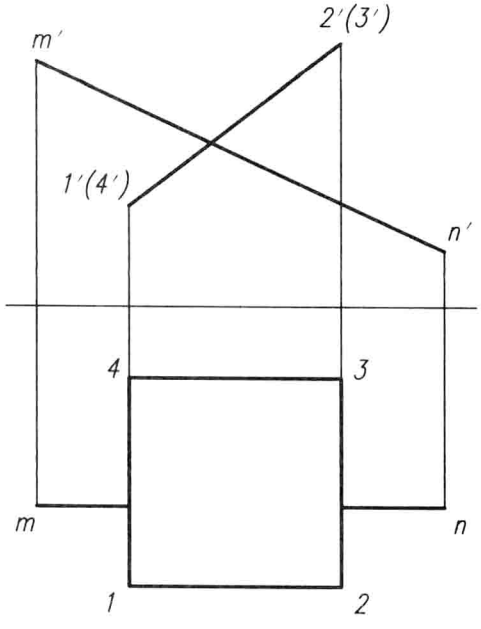


2-33 直线*EF*平行于平面△*ABC*，补全平面的*H*面投影。

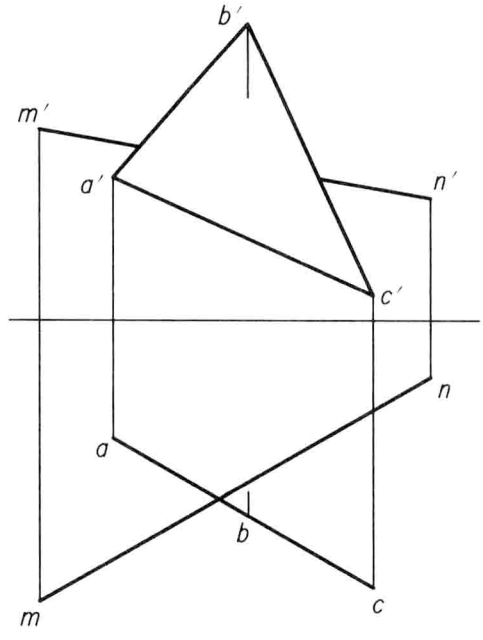


2-34 求直线*MN*与平面交点*K*，并区分直线的可见性。

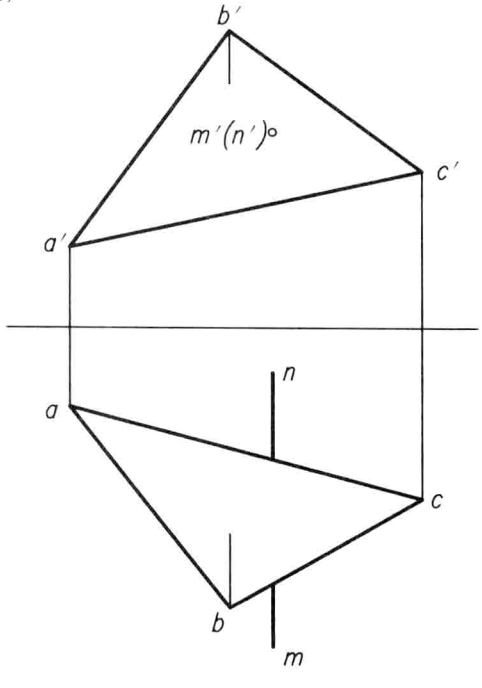
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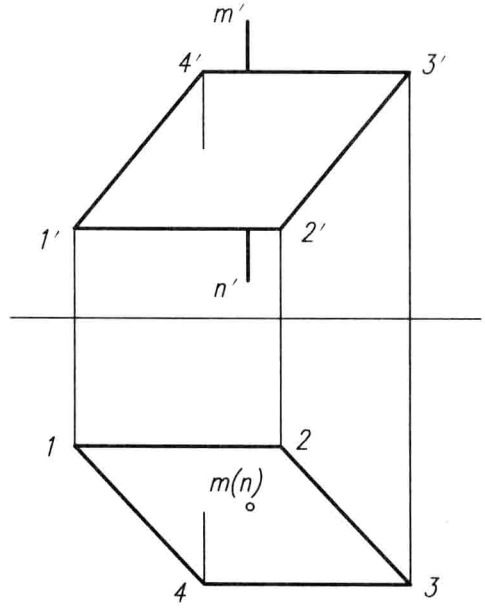
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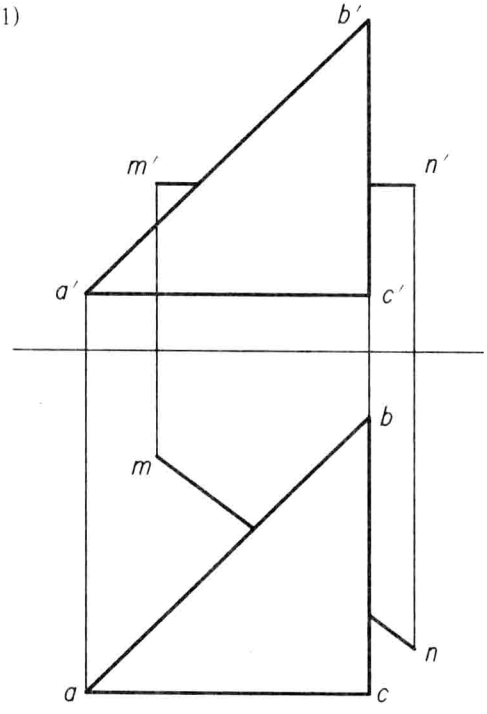


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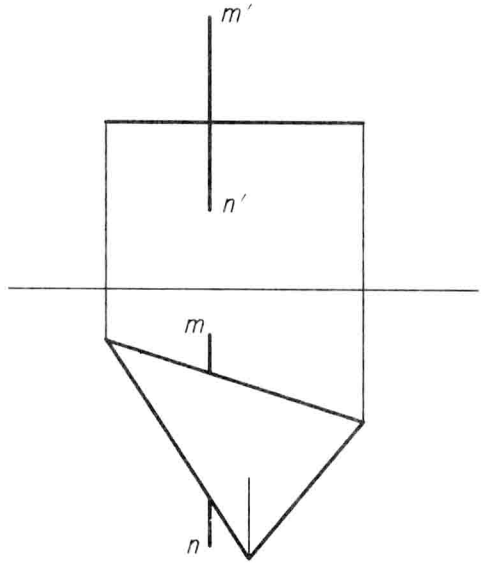
姓名

2-35 求直线*MN*与平面交点*K*，并区分直线的可见性。

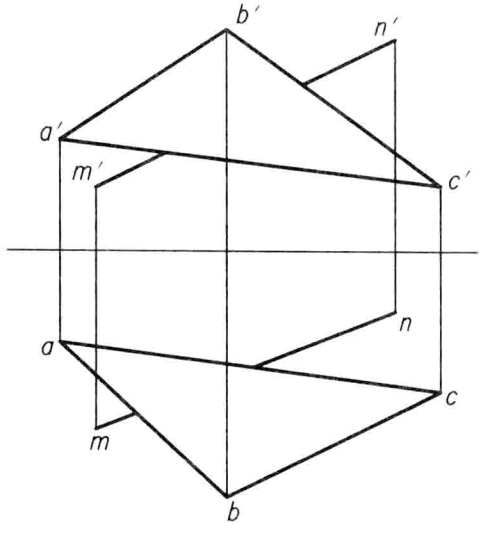
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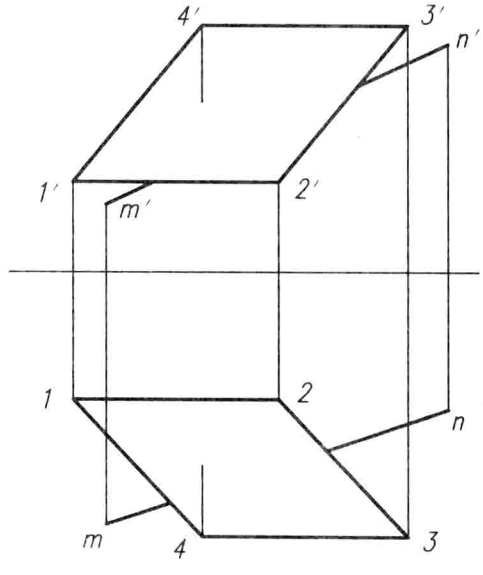
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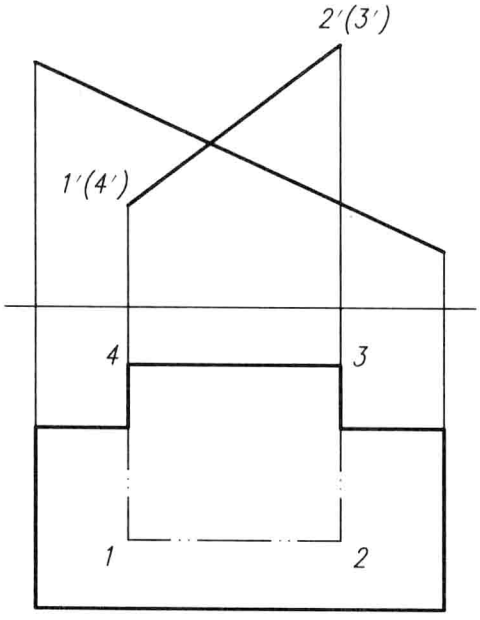


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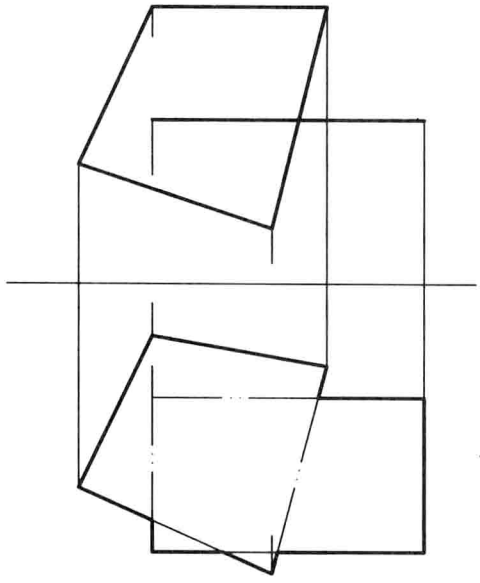
姓名

2-36 求平面与平面的交线，并区分平面的可见性。

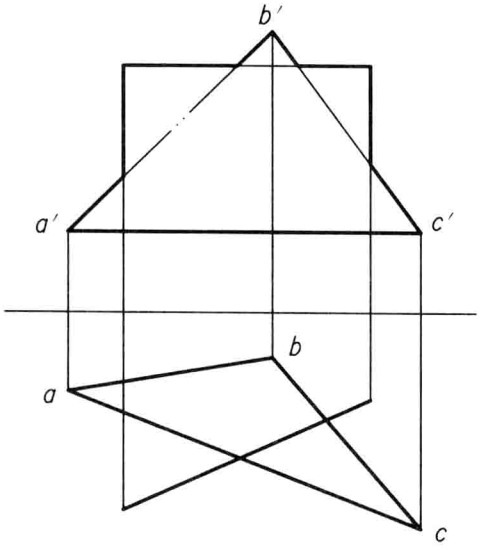
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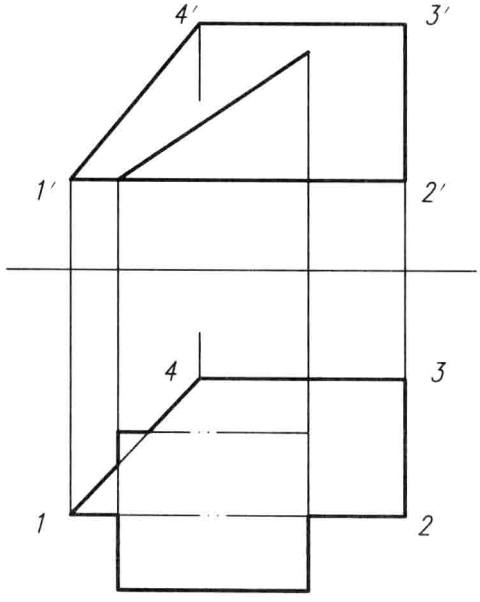
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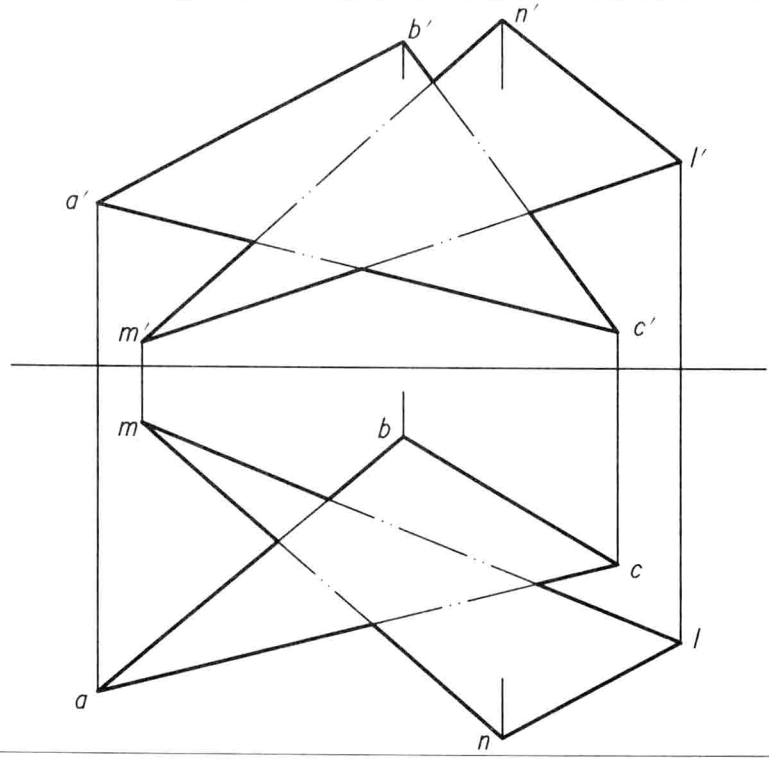


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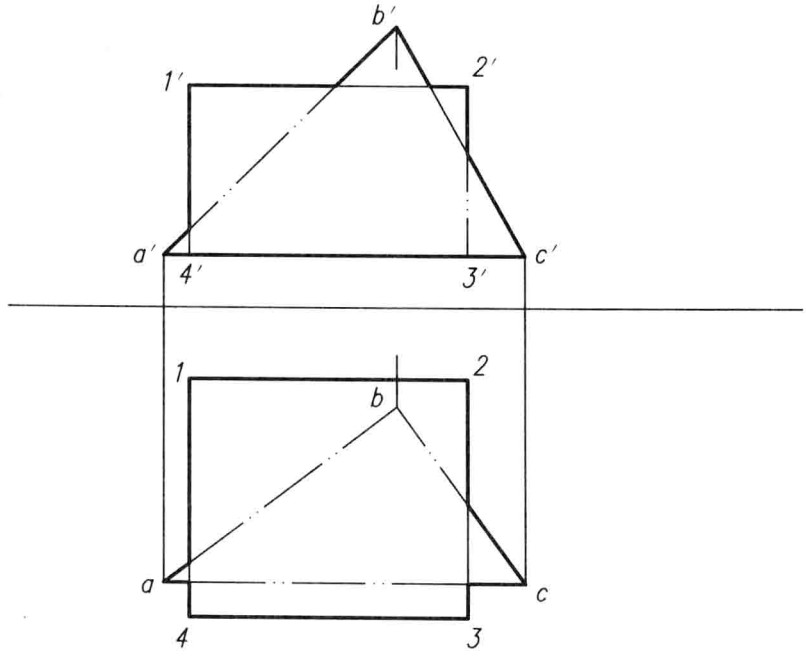
姓名

2-37 两一般位置平面相交，求交线，并判别平面的可见性。

(1)



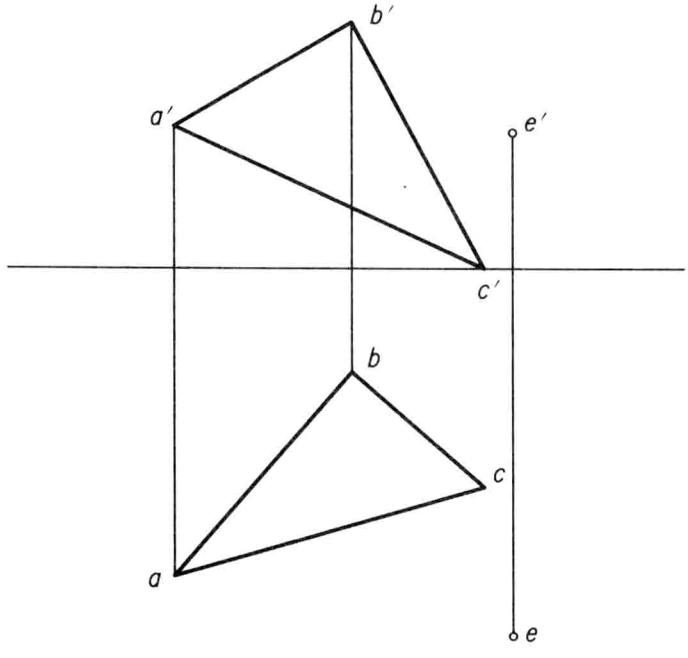
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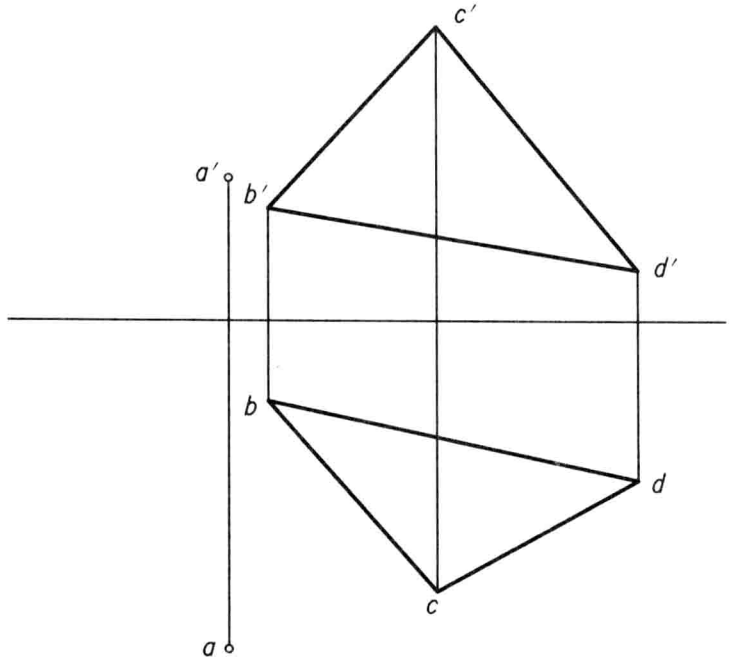
班级

姓名

2-38 过E点作直线垂直于平面ABC。



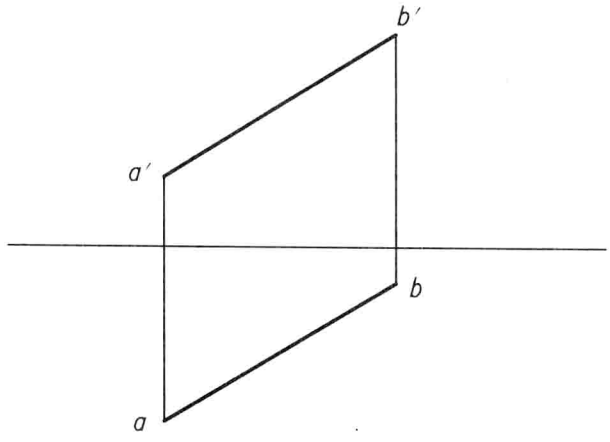
2-39 过A点作平面垂直于平面BCD。



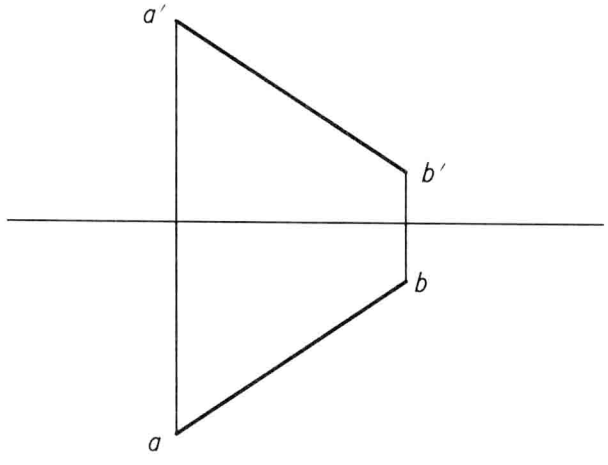
班级

姓名

3-1 用换面法求直线*AB*的实长及对*H*面的倾角 α。

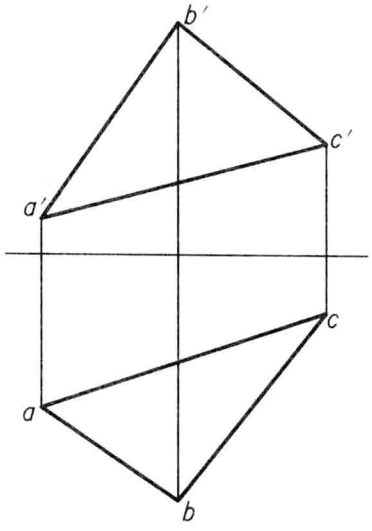


3-2 用换面法将一般位置直线变换为投影面的垂直线。

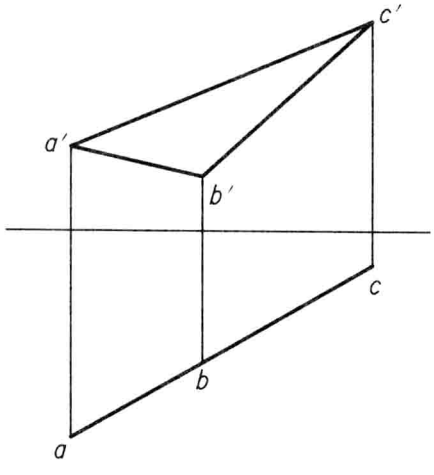


班级 姓名

3-3 用换面法求平面*ABC*对*H*面的倾角α。



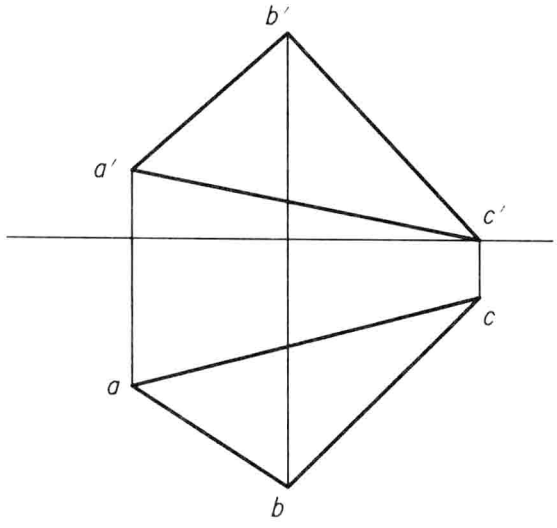
3-4 用换面法求铅垂面的实形。



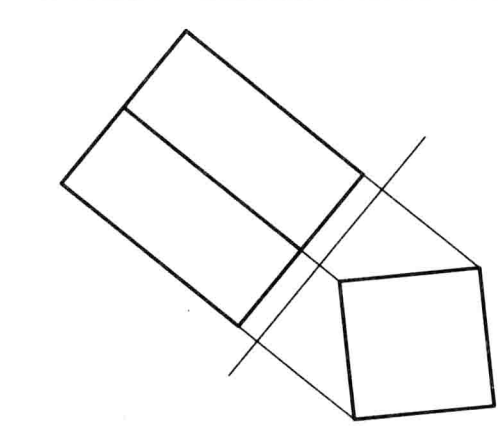
班级

姓名

3-5 在平面*ABC*内作一直线*AD*，使其与直线*AB*的夹角为30°。



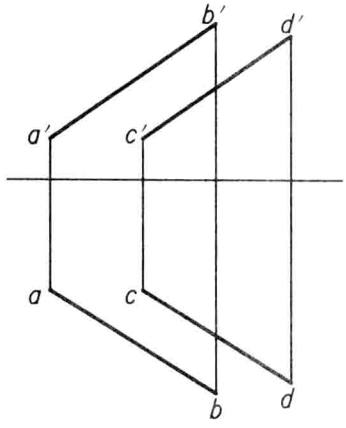
3-6 求作四棱柱的*V*面投影。



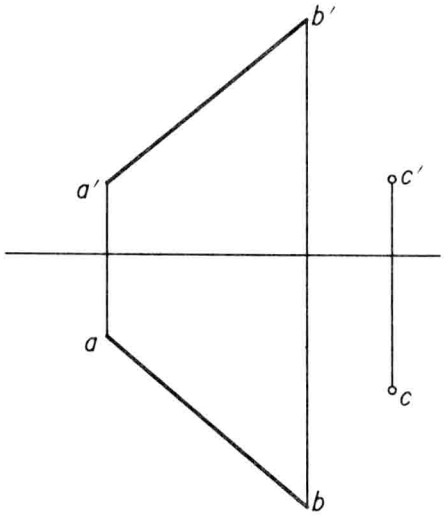
班级

姓名

3-7 用换面法求两平行直线间的距离。

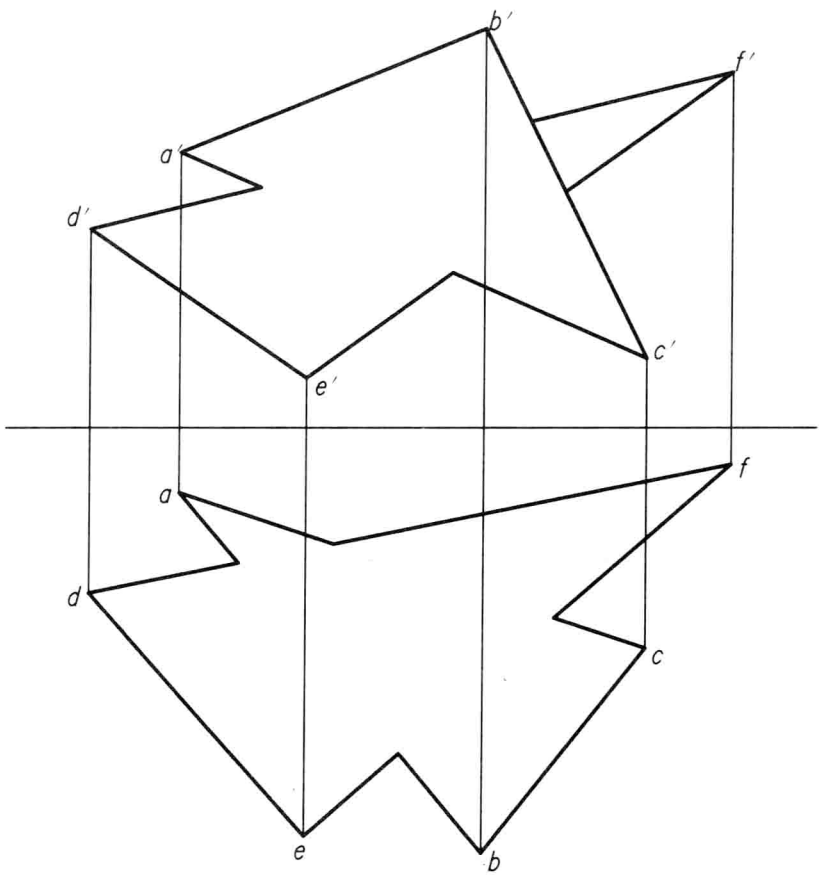


3-8 用换面法求点*C*到一般位置直线*AB*的距离。

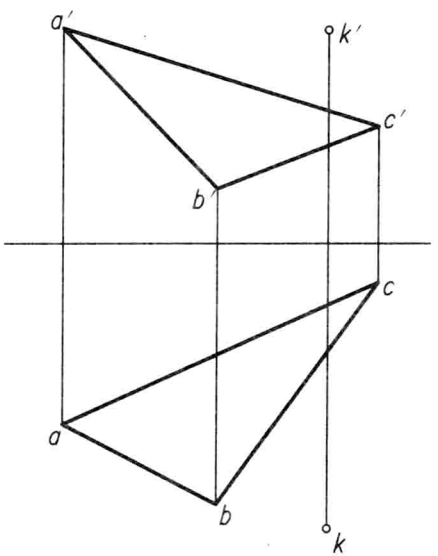


班级　　姓名

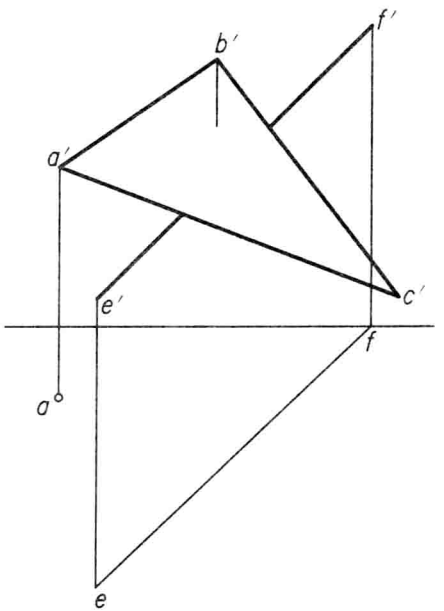
3-9 用换面法求两一般位置平面的交线，并判断可见性。



3-10 求点*K*到一般位置平面*ABC*的距离。

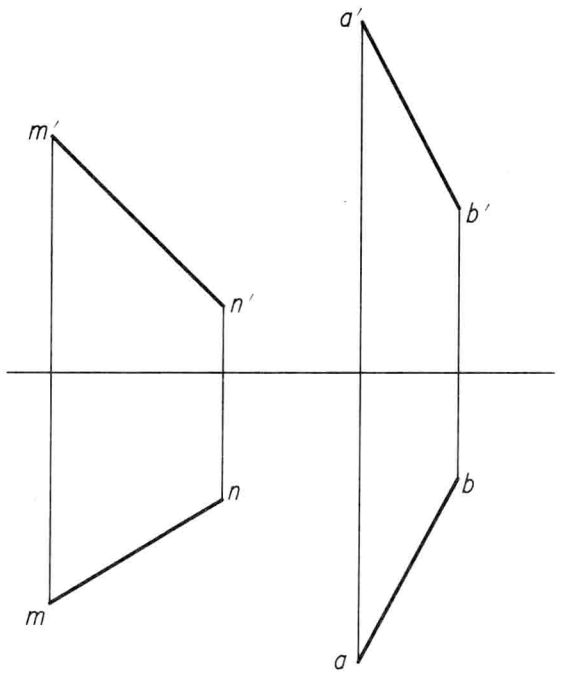


3-11 已知平面*ABC*与直线*EF*垂直，补全平面*ABC*的水平投影，并求*EF*与平面*ABC*的垂足，判断*EF*可见性。

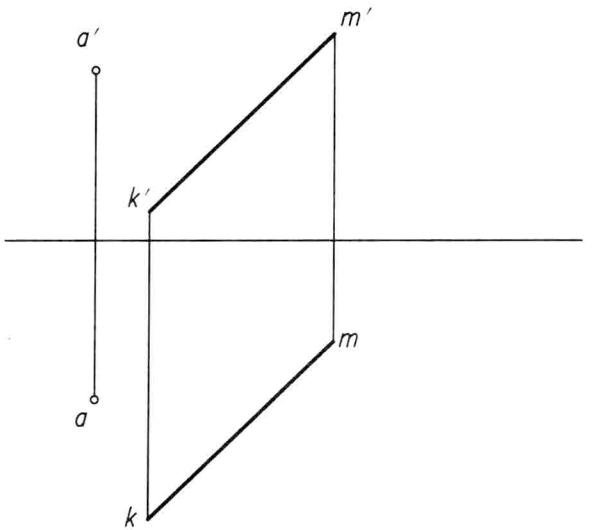


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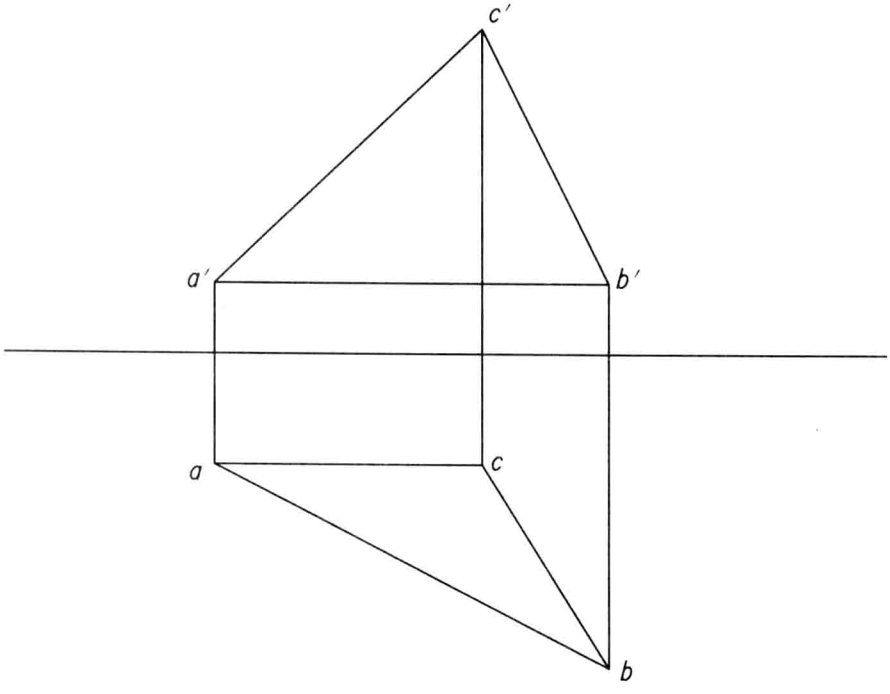
3-12 在直线*MN*上求一点*C*，使*AC*=*BC*。



3-13 已知正方形*ABCD*的边*BC*在直线*KM*上，补全正方形的两面投影。



3-14 求作以平面*ABC*为底的三棱锥的两面投影，过锥顶的高线通过底面三角形的垂心，实长为50 mm。

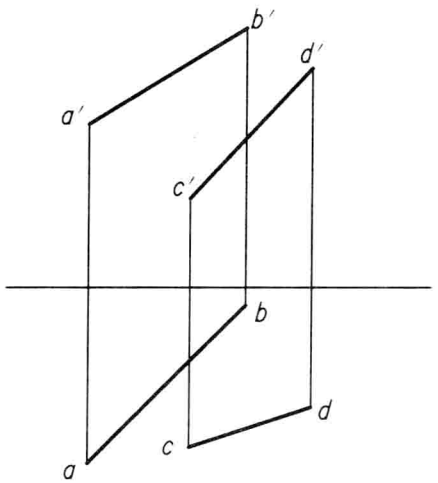


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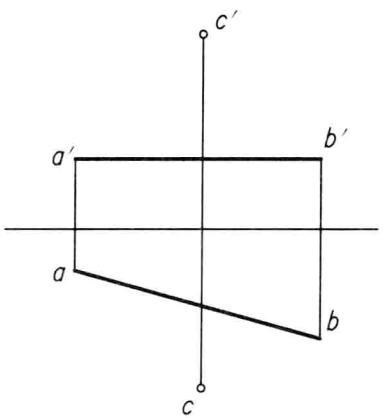
姓名

班级　　姓名

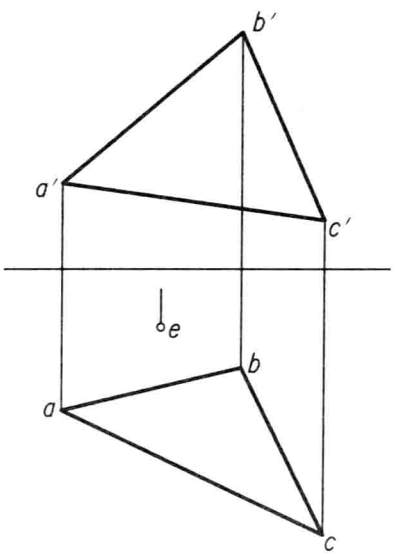
3-15 求作交叉两直线*AB*与*CD*的公垂线*MN*。



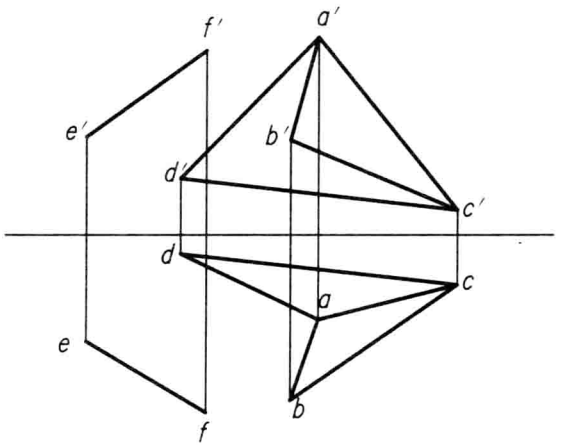
3-16 已知点*C*为等边三角形的一顶点，另两点在直线*AB*上，补全等边三角形的两面投影。



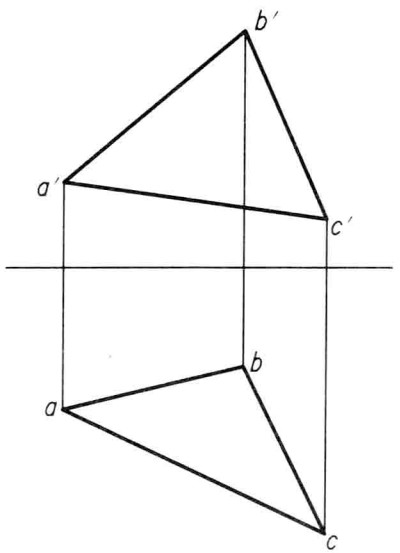
3-17 已知点*E*到平面*ABC*的距离为20 mm，求点*E*的*V*面投影。



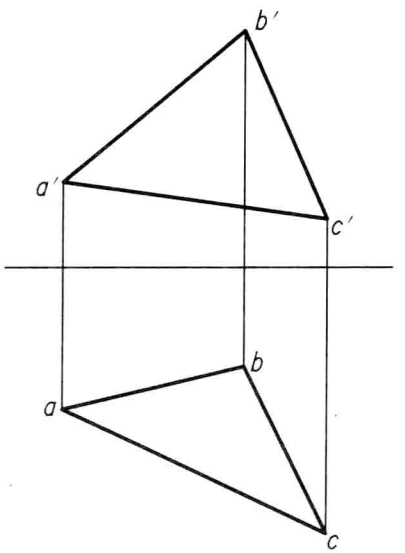
3-18 在直线*EF*上求一点*K*，使其与相交两平面*ABC*和*ADC*等距。



3-19 已知点E在平面ABC上，与点A、B的距离均为20 mm，求点E投影。

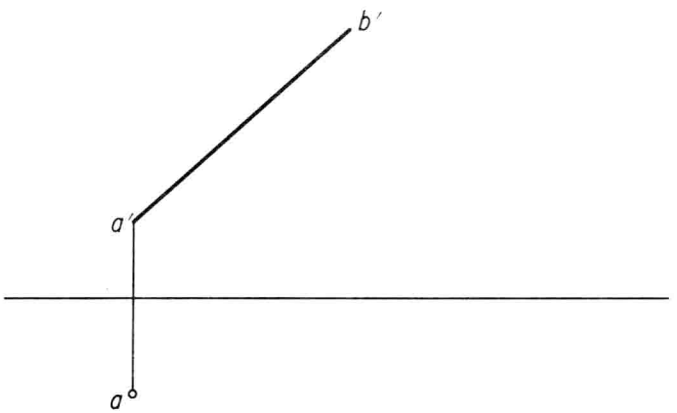


3-20 用旋转法求一般位置平面ABC对V面的倾角β。

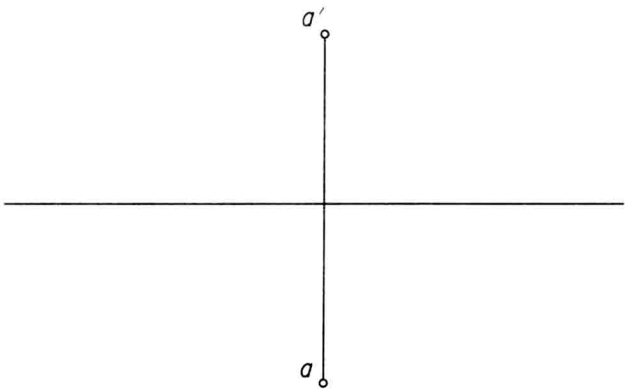


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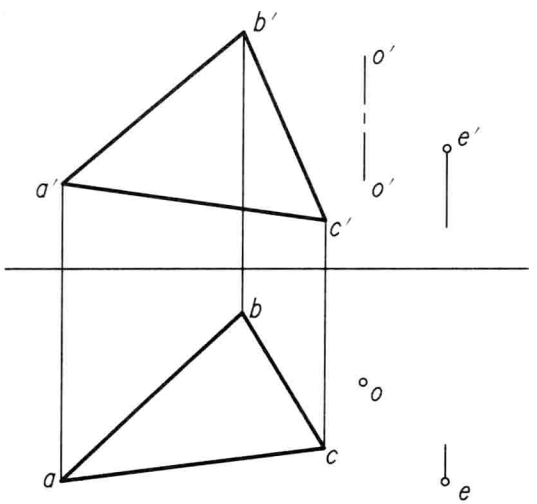
3-21 已知直线*AB*对*H*面的倾角为30°，用旋转法补全其水平投影。



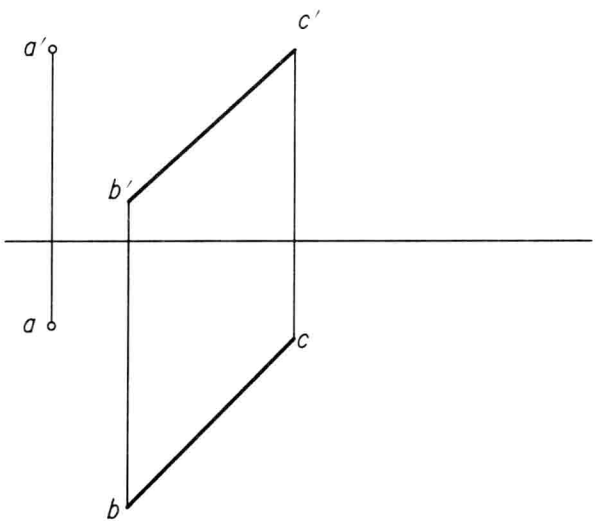
3-22 已知直线*AB*的实长为30 mm，对*H*面倾角为30°，对*V*面倾角为45°，用旋转法补全其*H*、*V*面投影。



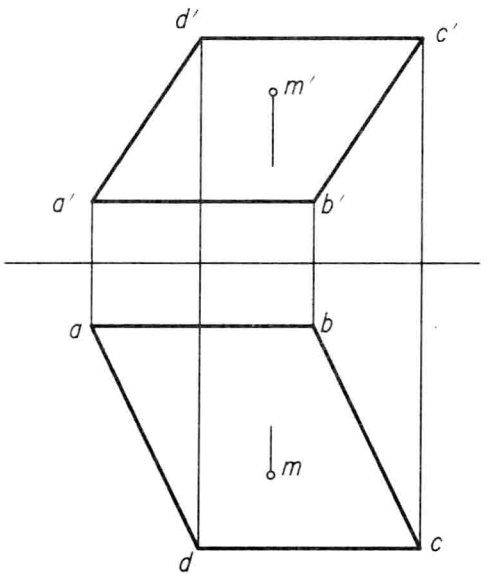
3-23 将点*E*绕*OO*轴旋转到平面*ABC*上。



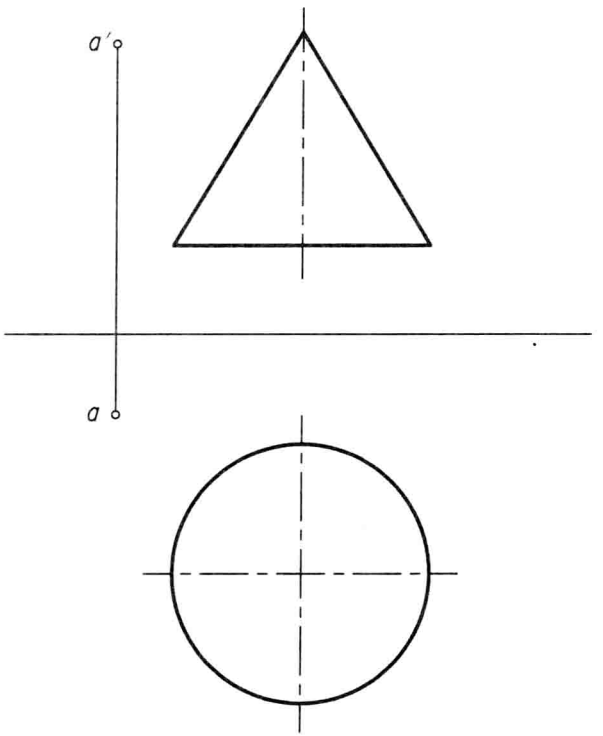
3-24 过点*A*作直线*AK*与已知直线*BC*垂直相交。(用旋转法求解)



3-25 在平面*ABCD*内过点*M*作直线*MN*，使其与*V*面倾角为45°。



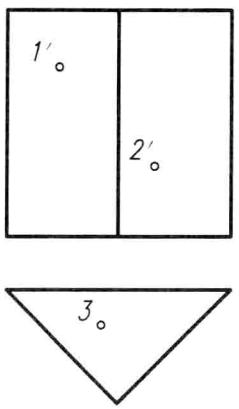
3-26 在圆锥面上求一点*B*，使其与点*A*距离最近。



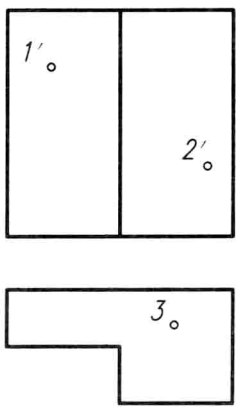
班级 姓名

4-1 已知平面立体的两个投影，求作第三个投影，并求作立体表面上已知点的其余两个投影。

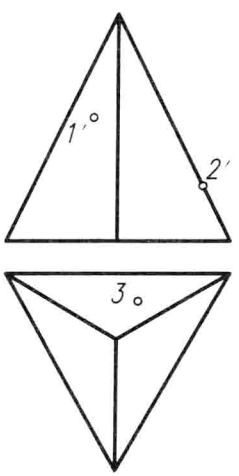
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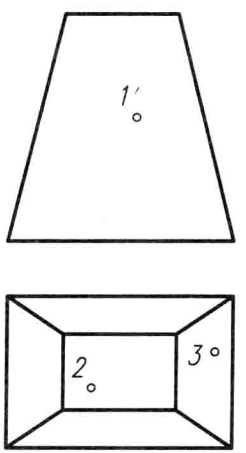
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(3)



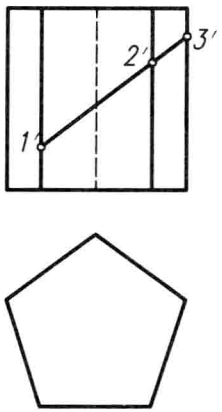
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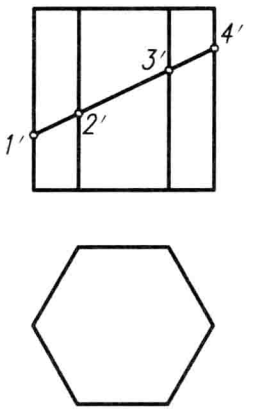
班级　　姓名

4-2 已知平面立体的两个投影，求作第三个投影，并求作立体表面和棱线上已知点、线的其他投影。

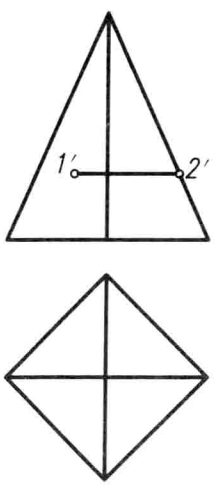
(1)



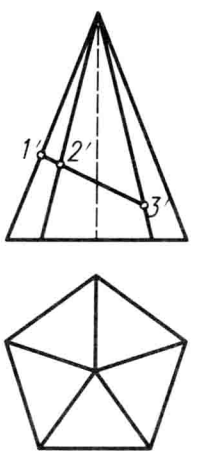
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(3)



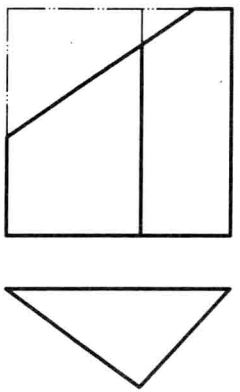
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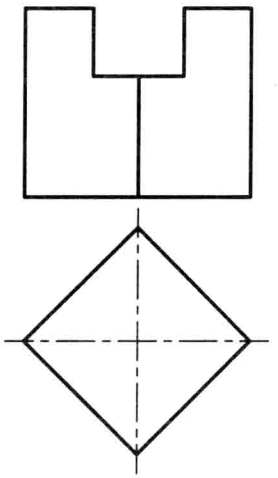
班级　　姓名

4-3 完成平面立体被截切后的三个投影图。

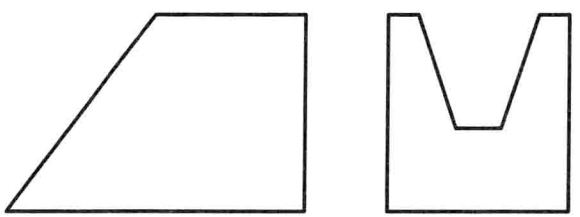
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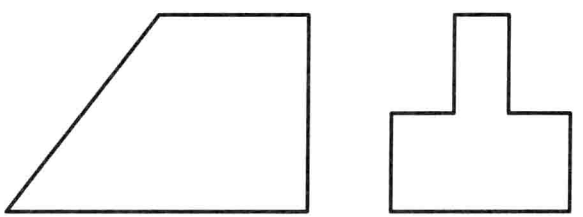
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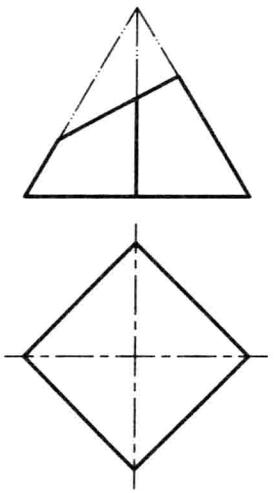
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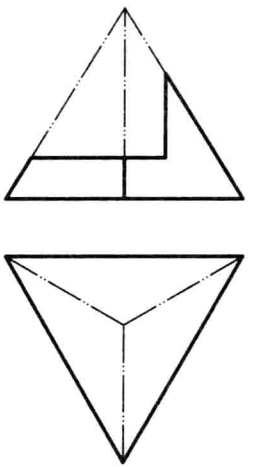
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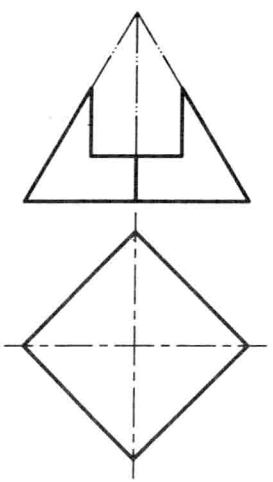
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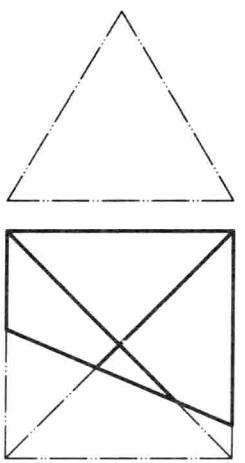
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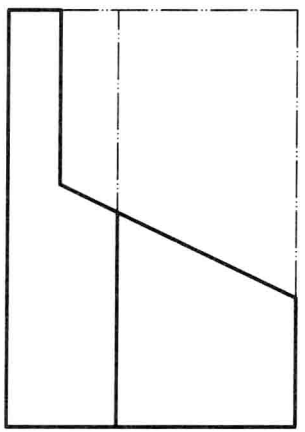
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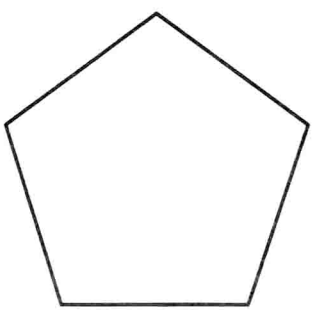


(8)

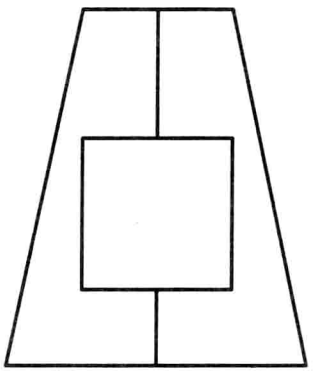


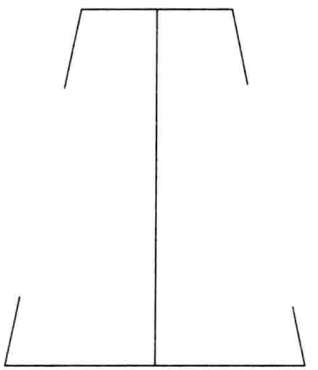
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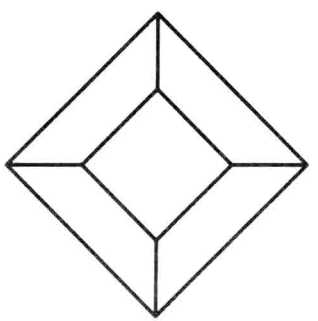




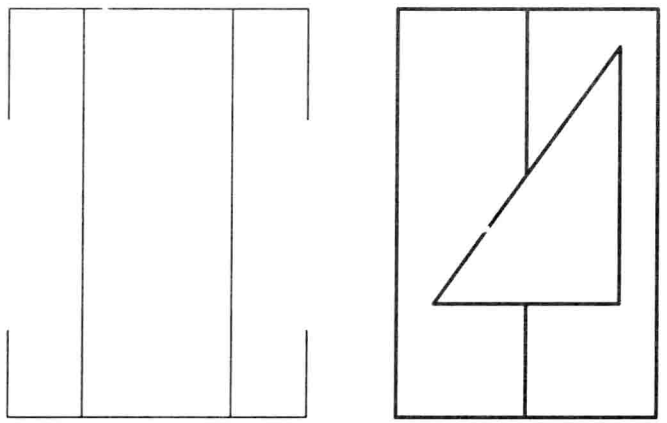
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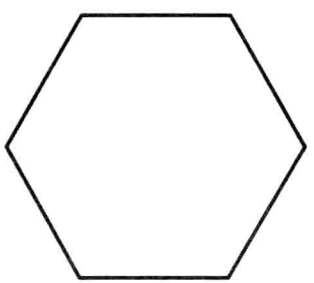




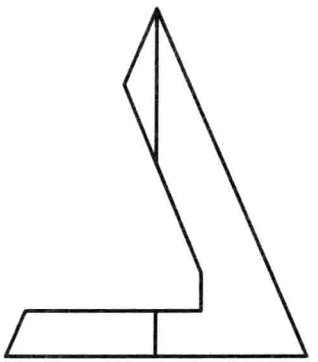


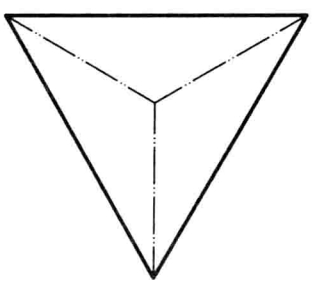
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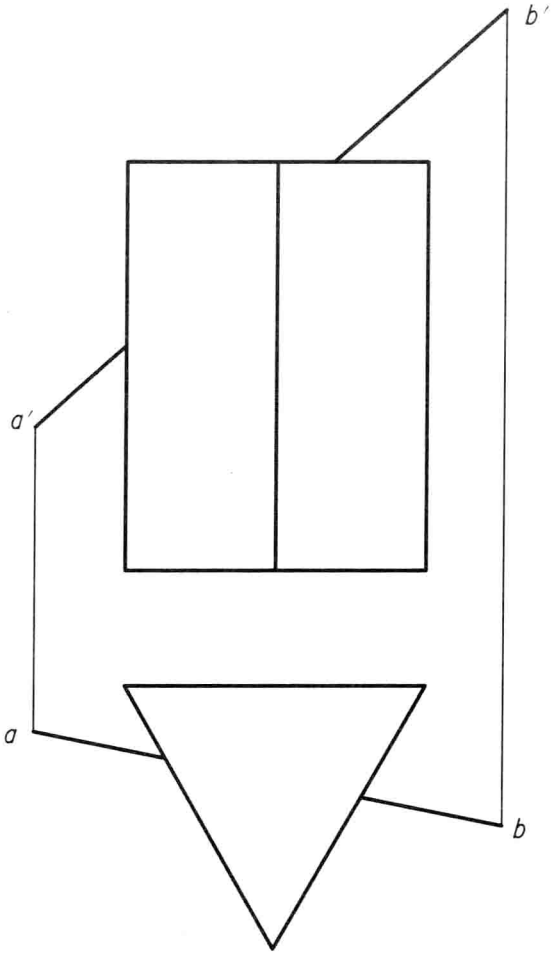
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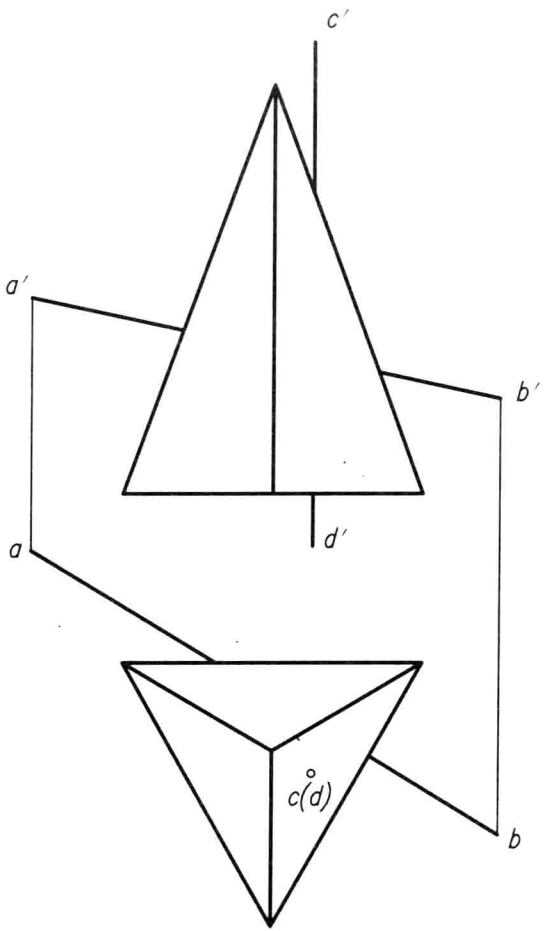


4-4 求直线与平面立体的交点，并判断可见性。

(1)



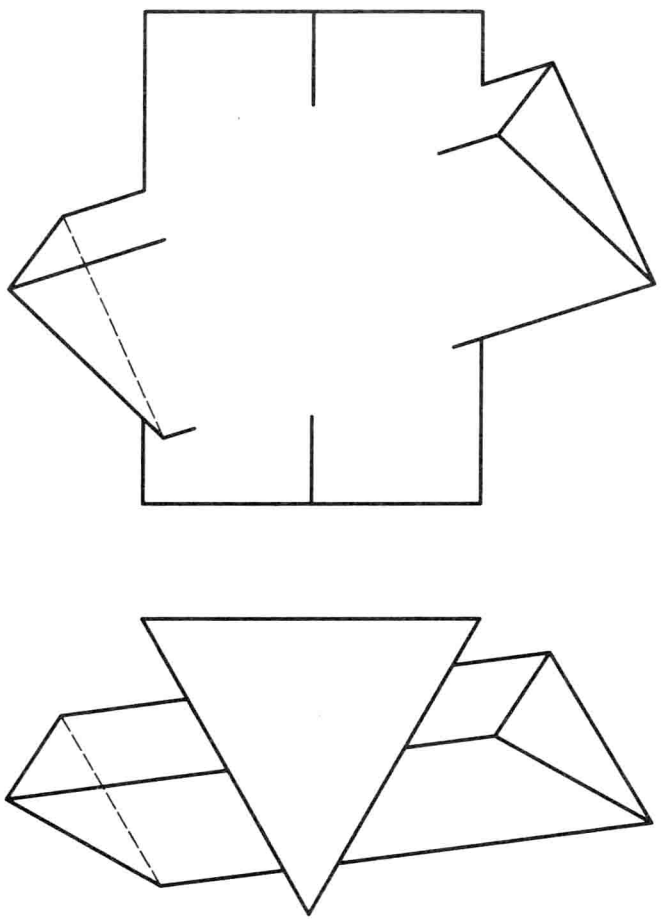
(2)



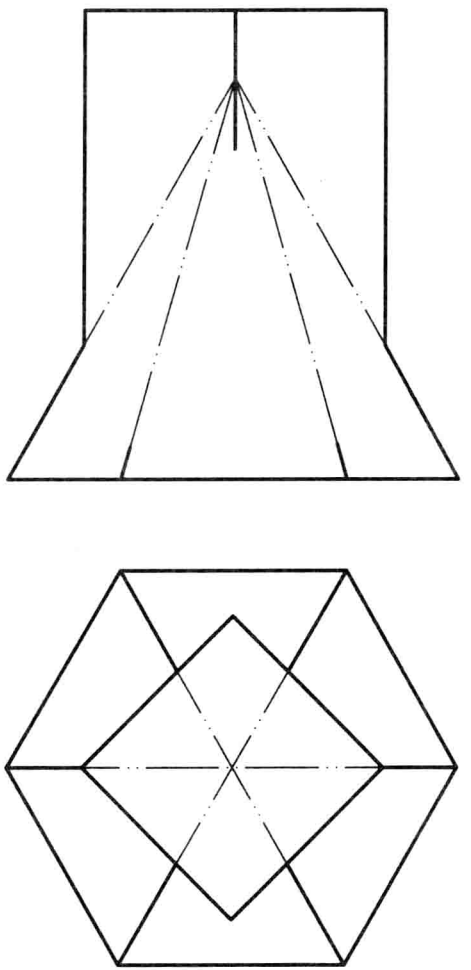
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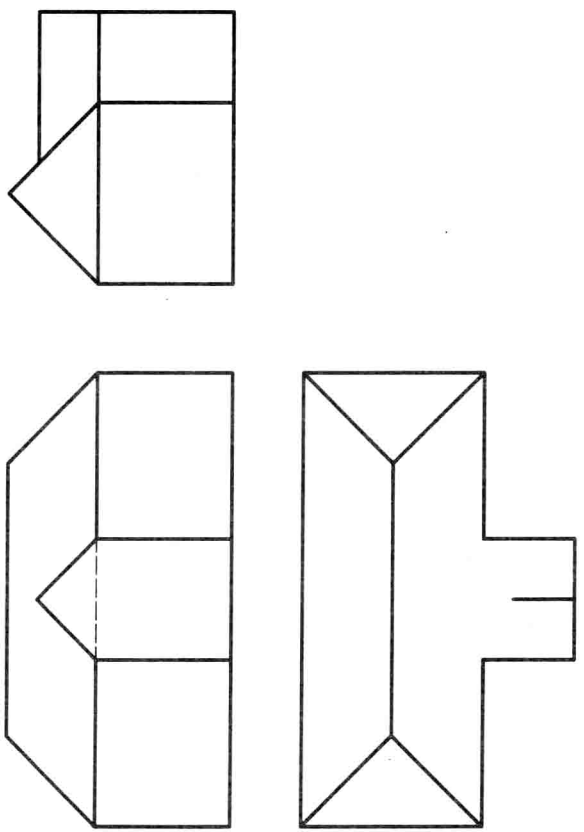
4-5 求作两平面立体的相贯线。

(1)

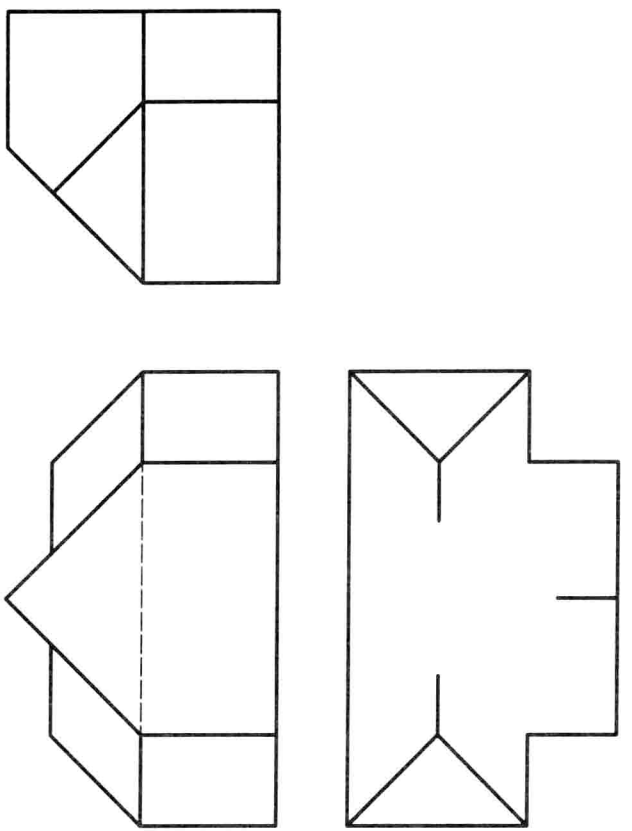


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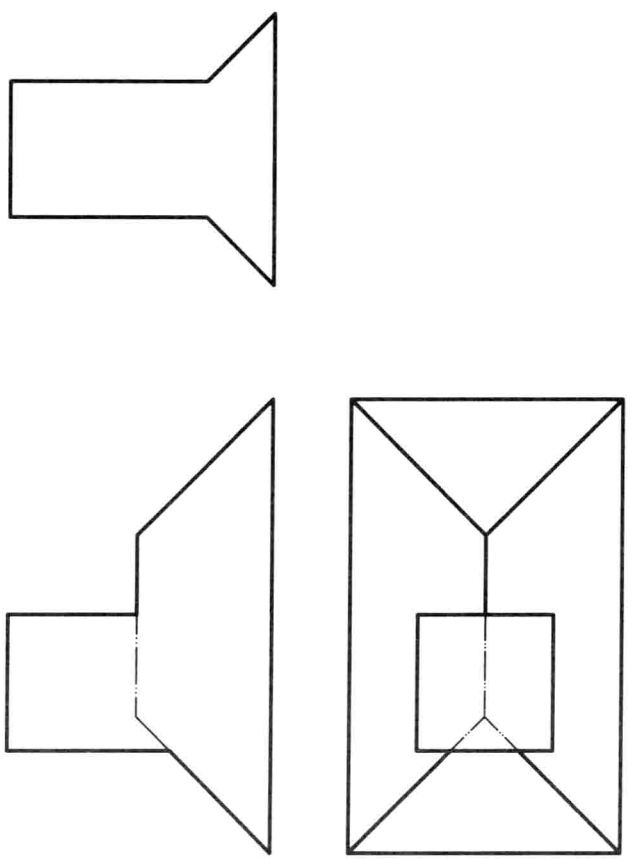




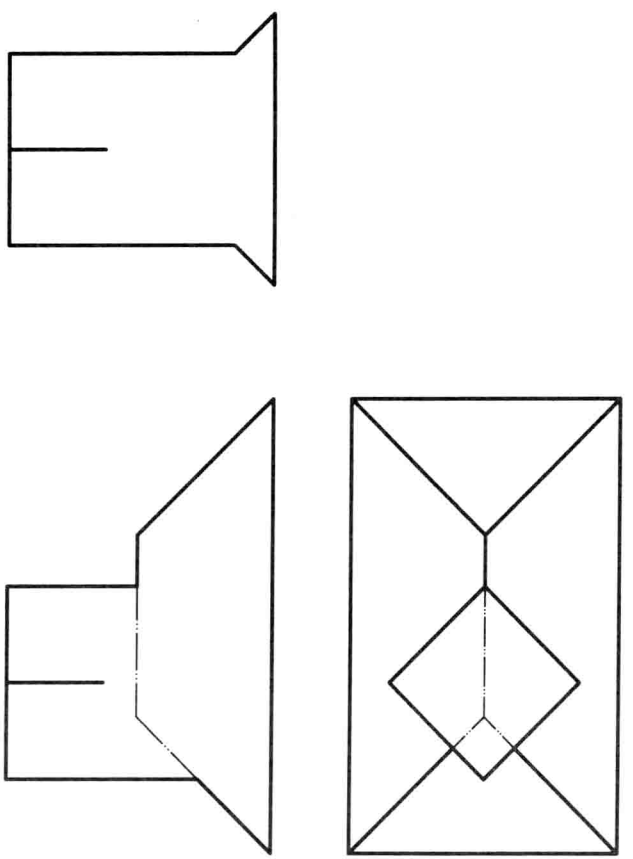
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(4)



(5)

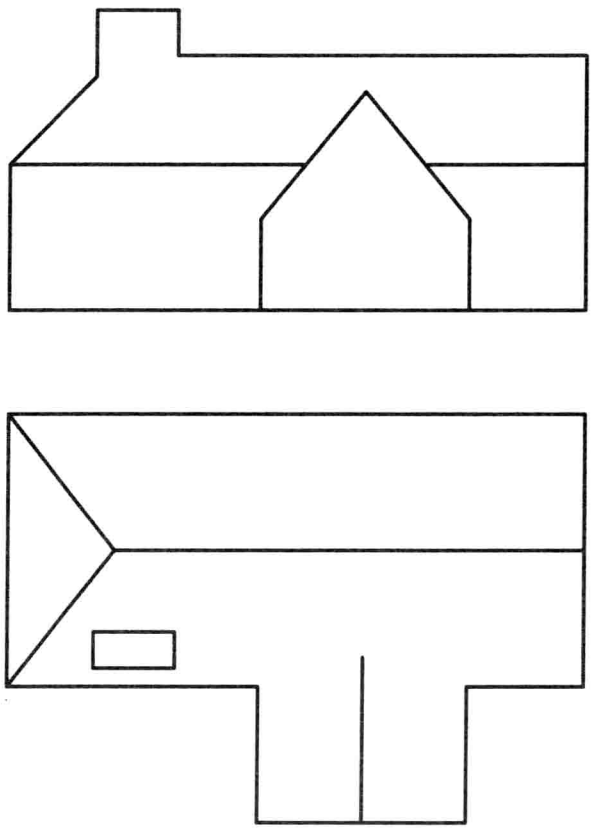


(6)

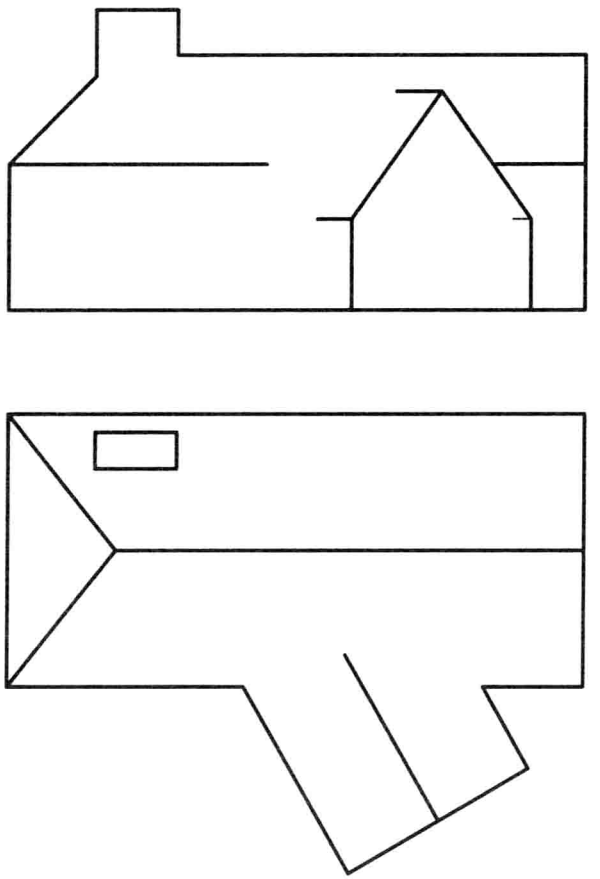
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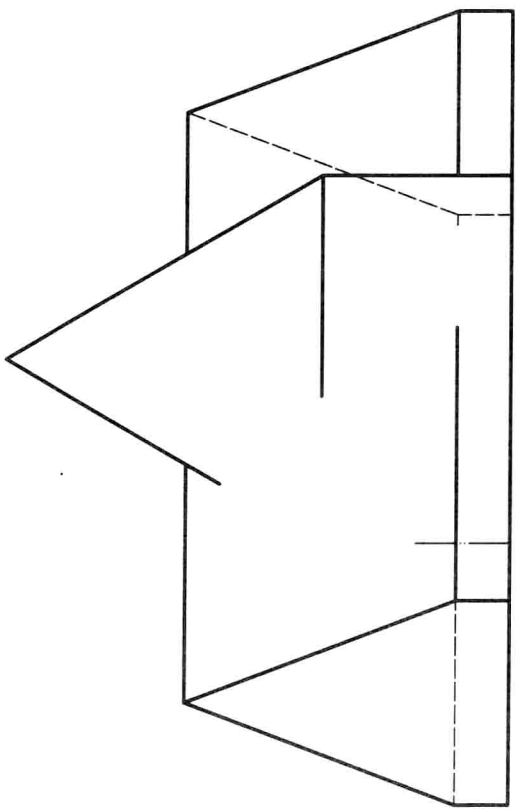
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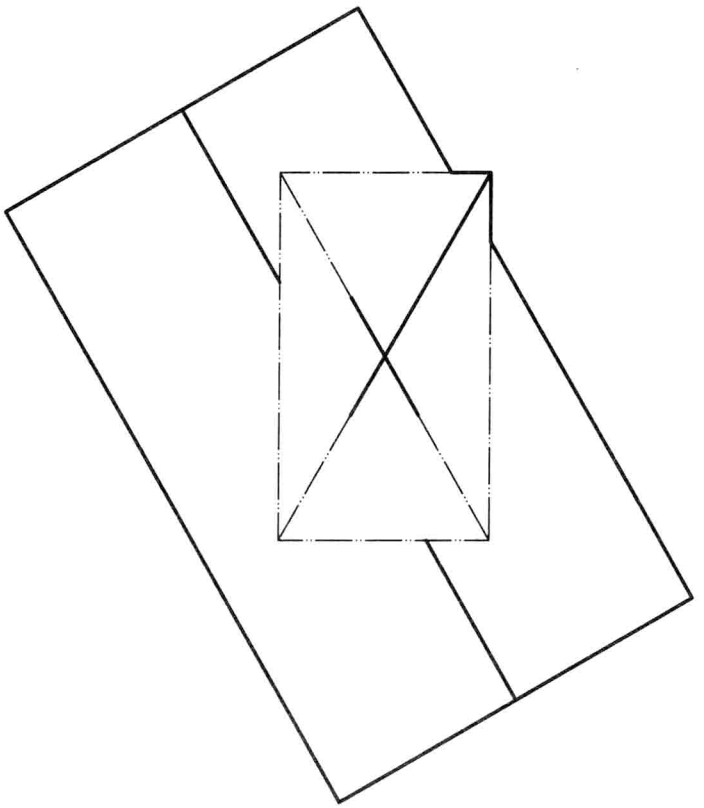
(9)



(10)



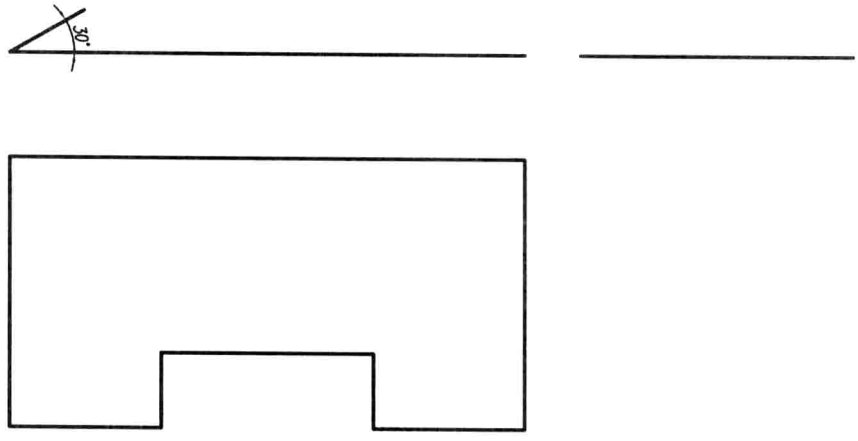




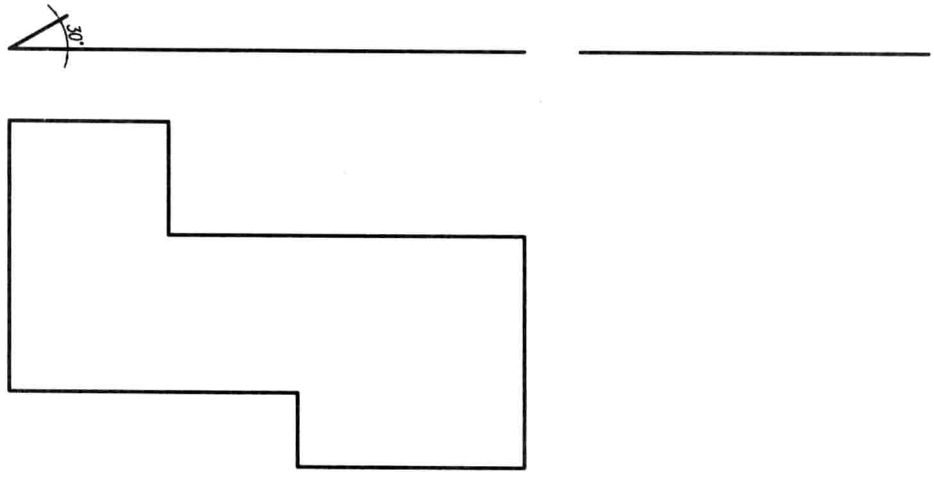
(11)

4-6 已知同坡屋面的倾角为30° 及檐口的*H*面投影，求屋面的三面投影。

(1)

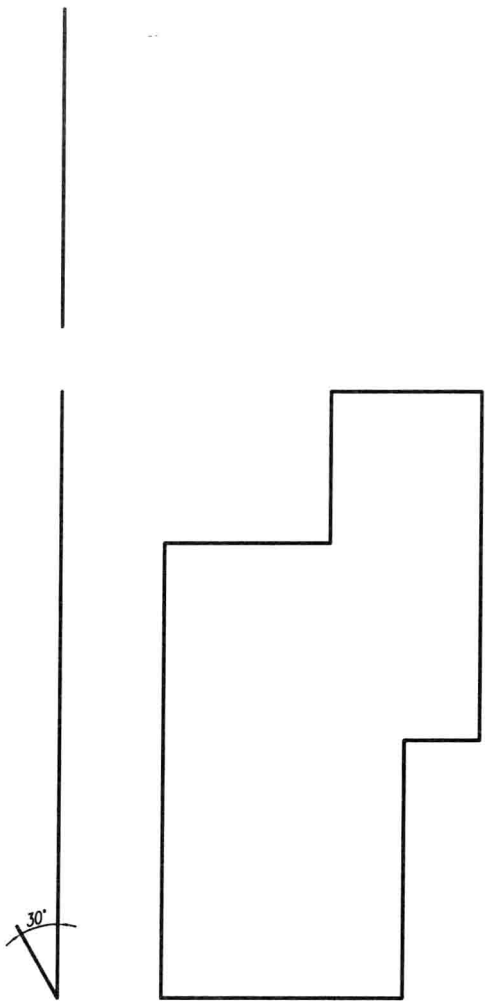


(2)

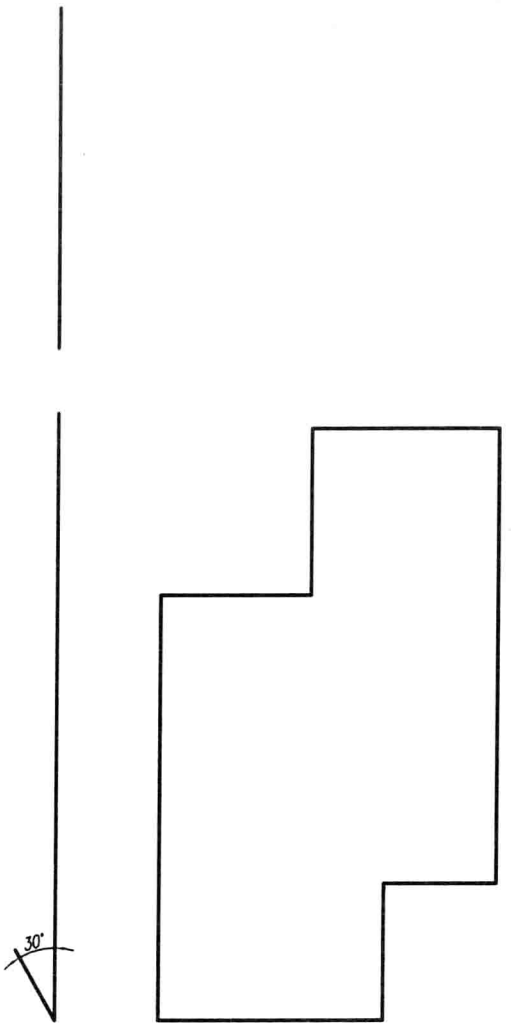


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(3)

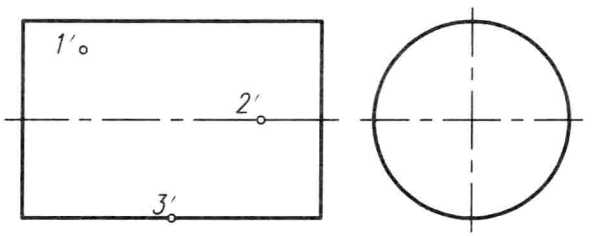


(4)

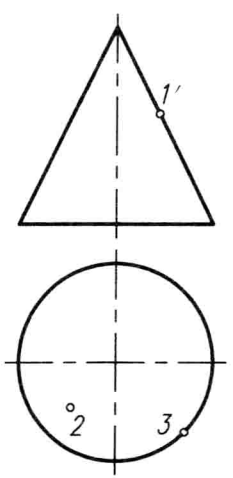


5-1 已知曲面立体的两个投影，求作第三个投影，并求作立体表面上已知点的其余两个投影。

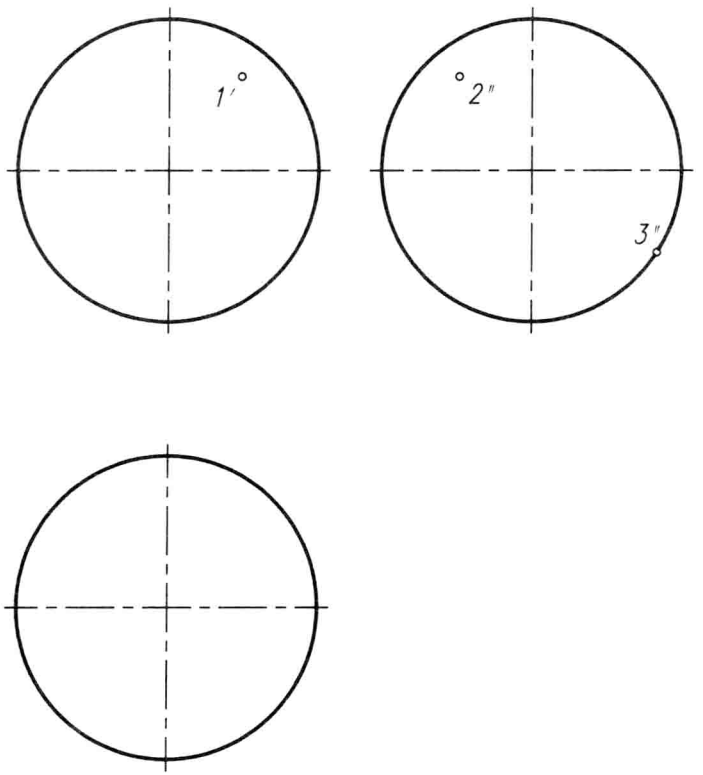
(1)



(2)

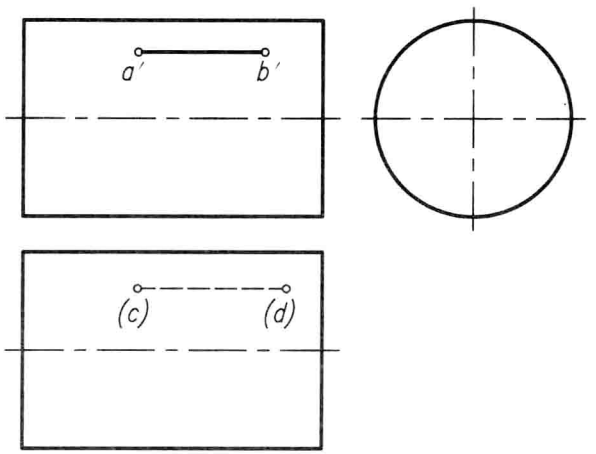


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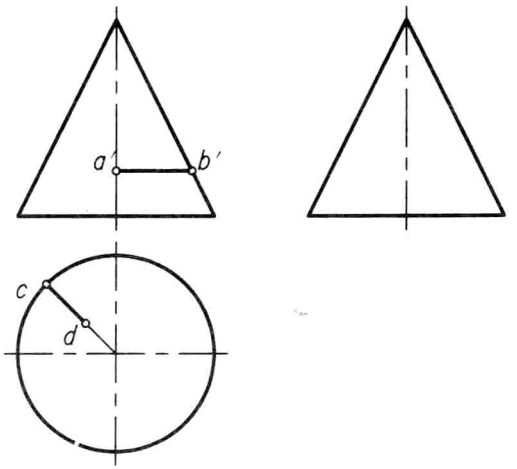


5-2 求作曲面立体表面上已知点、线的其他投影。

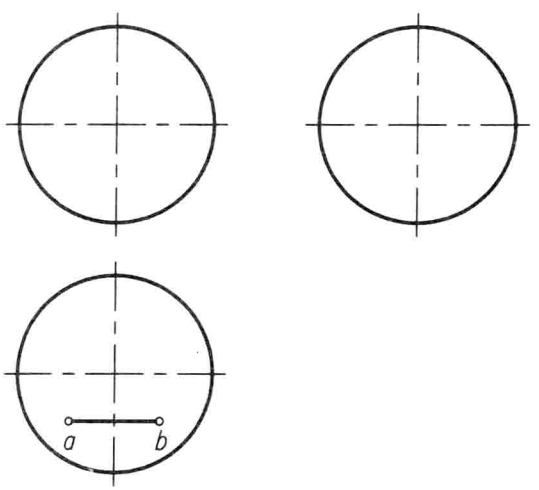
(1)



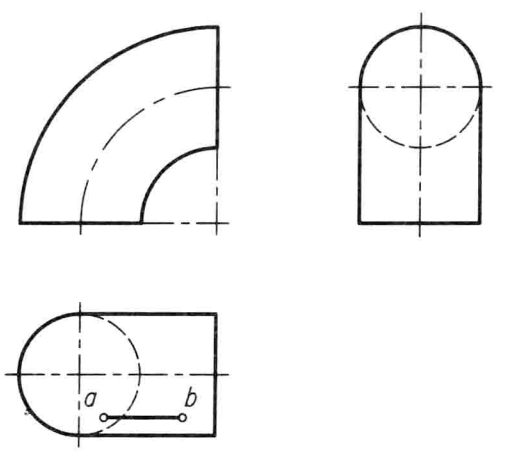
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(3)



(4)

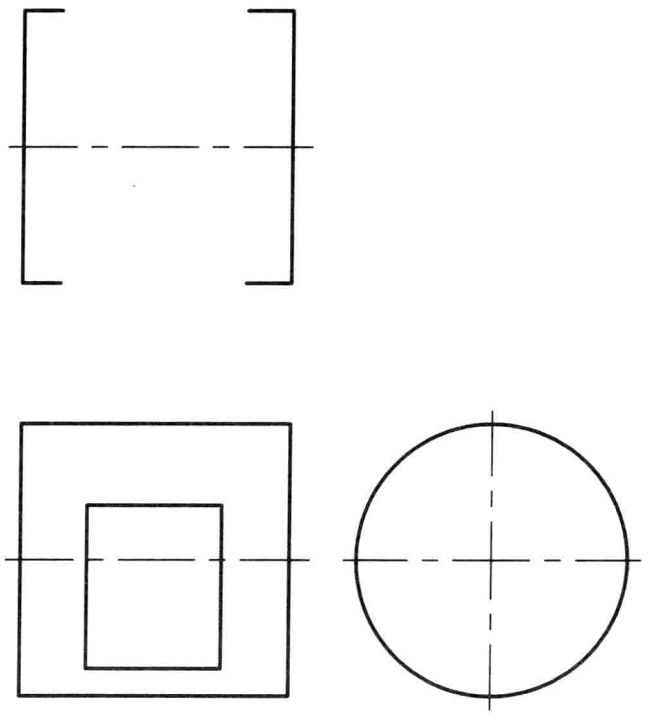


5-3 完成圆柱被截切后的三个投影图。

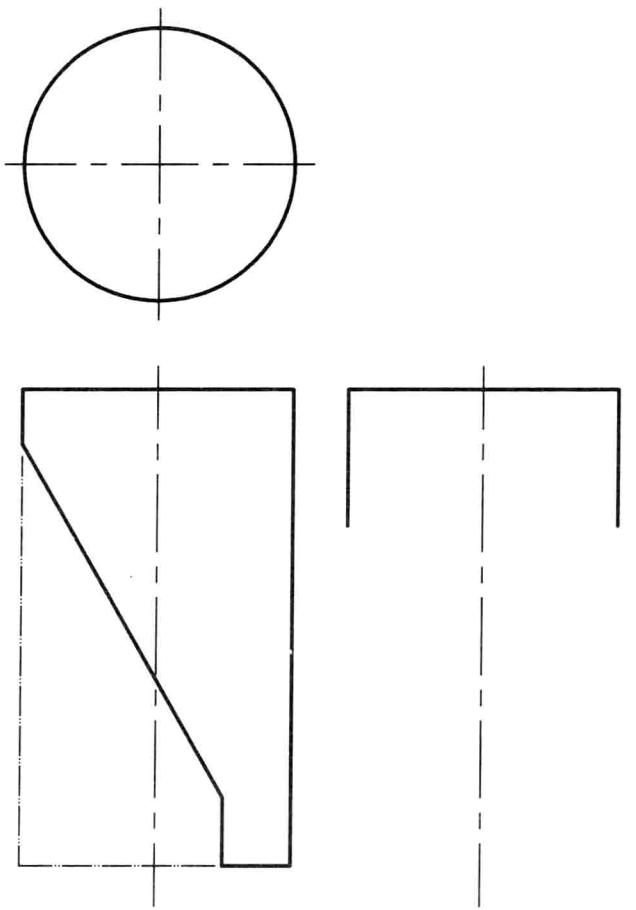
(1)

(2)

(3)

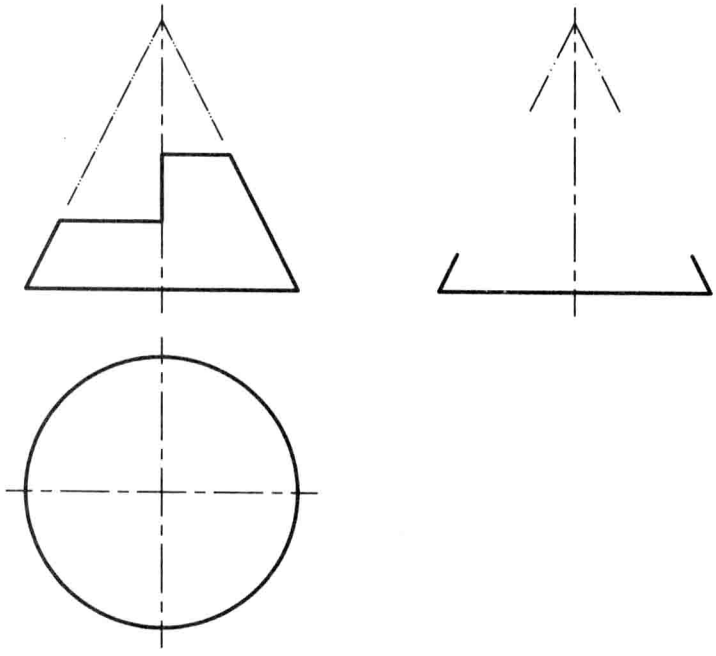


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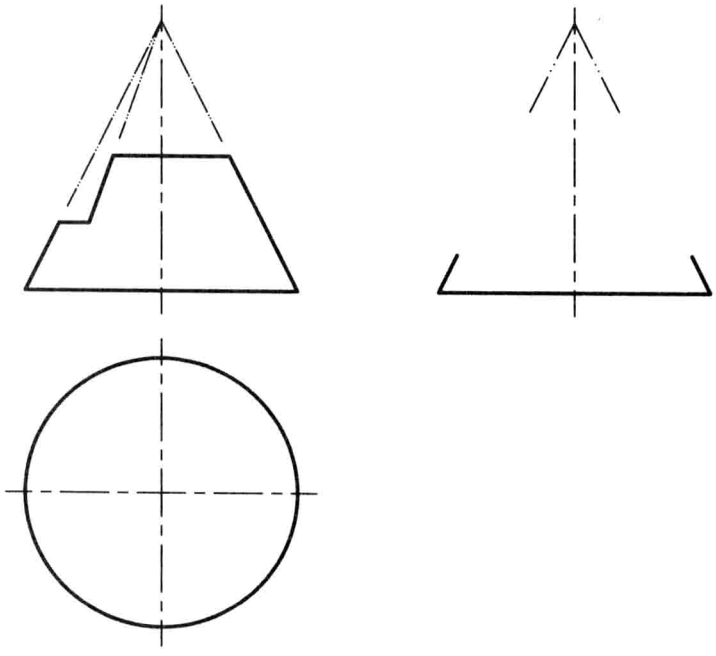


5-4 完成圆锥被截切后的三个投影图。

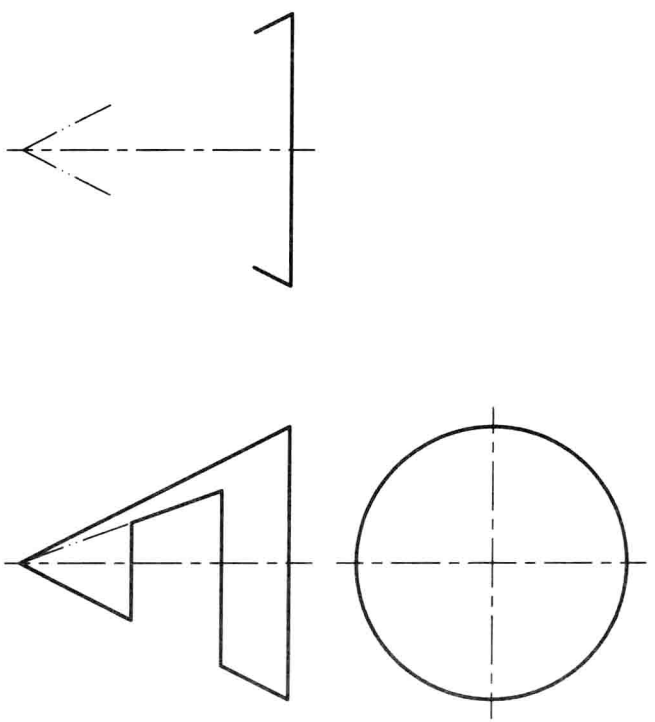
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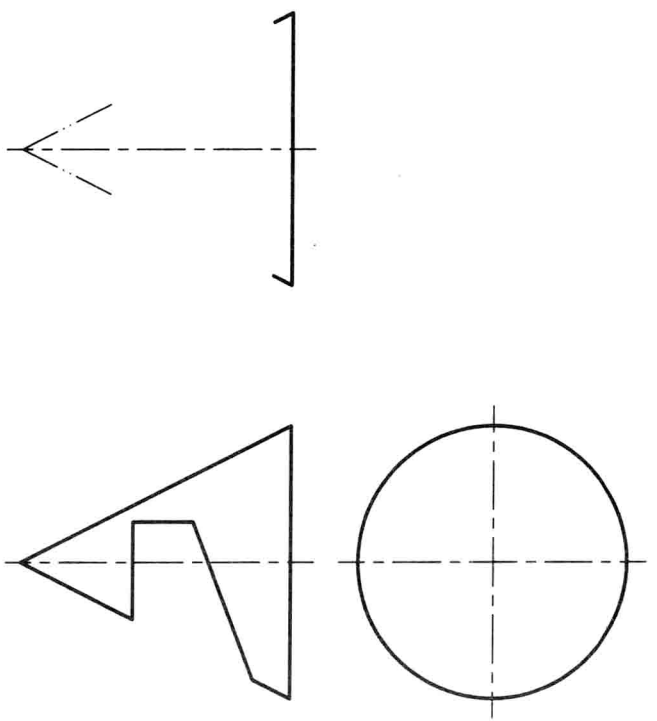
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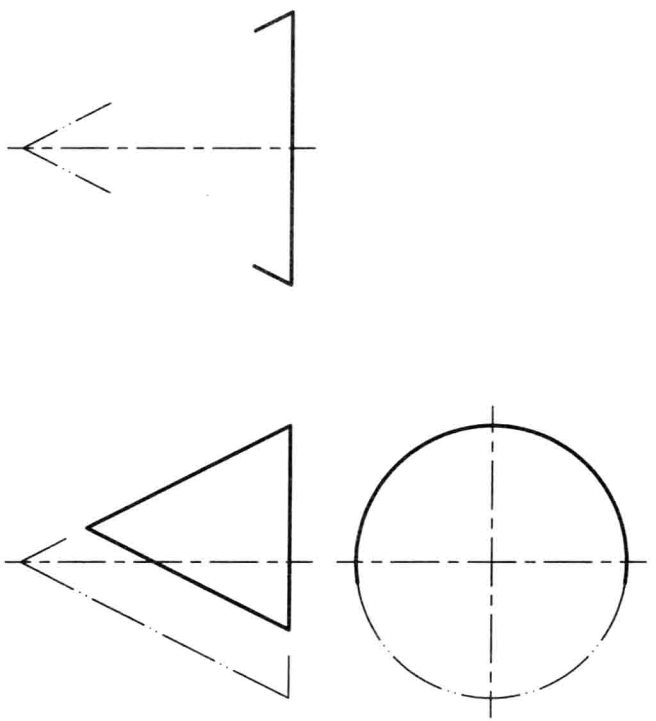


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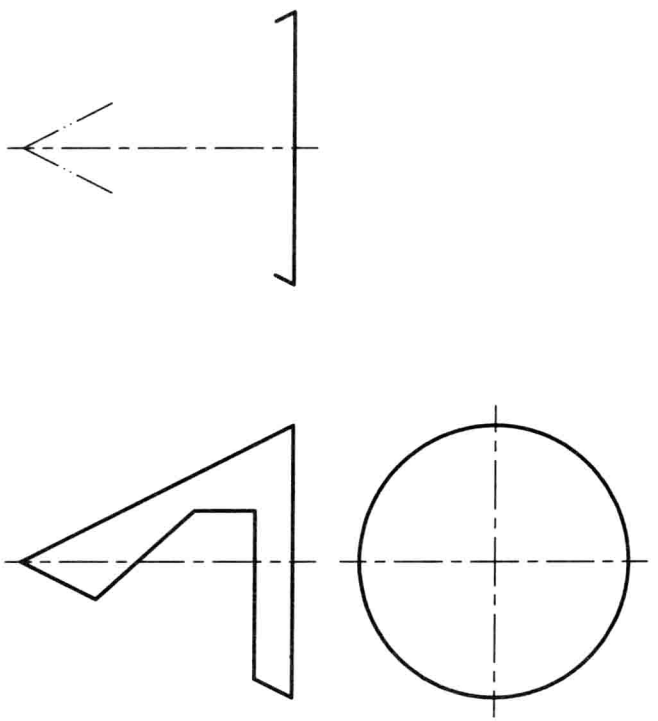


(4)

(5)



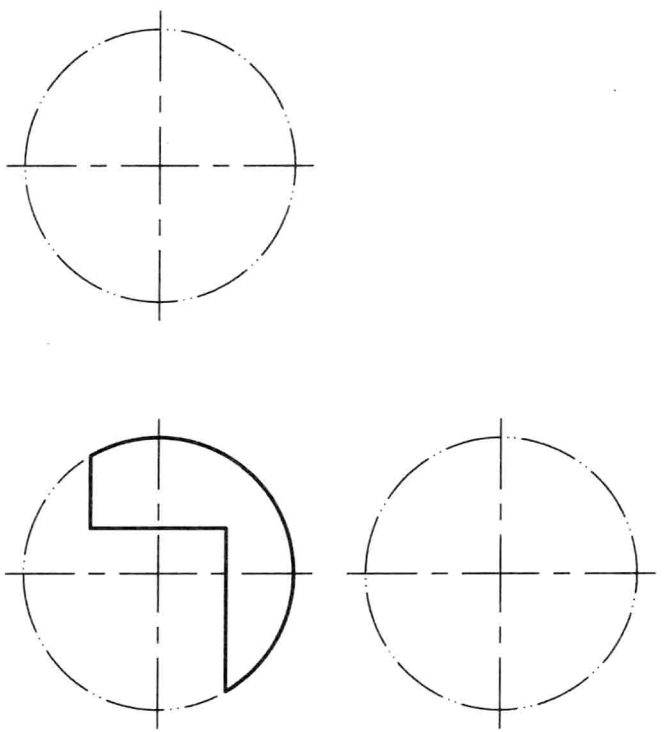
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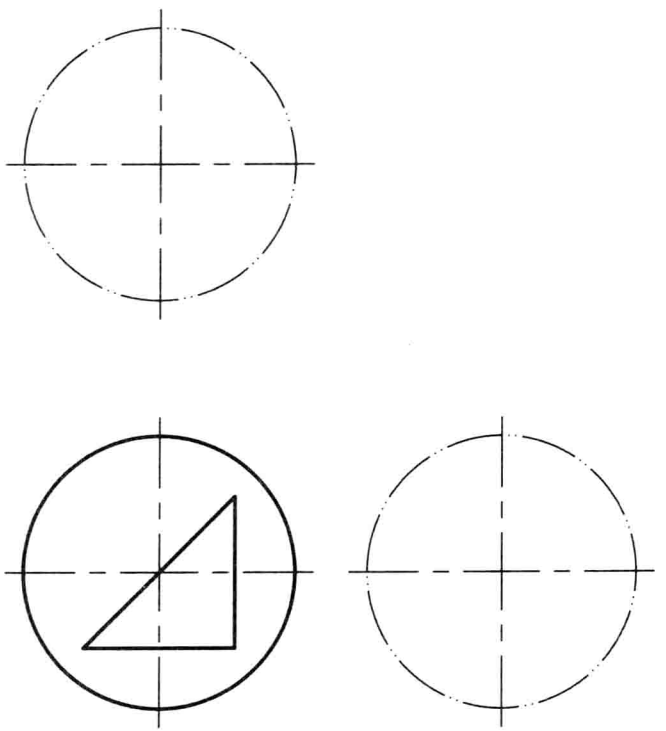
5-5　完成圆球被截切后的三个投影图。

(1)

(2)



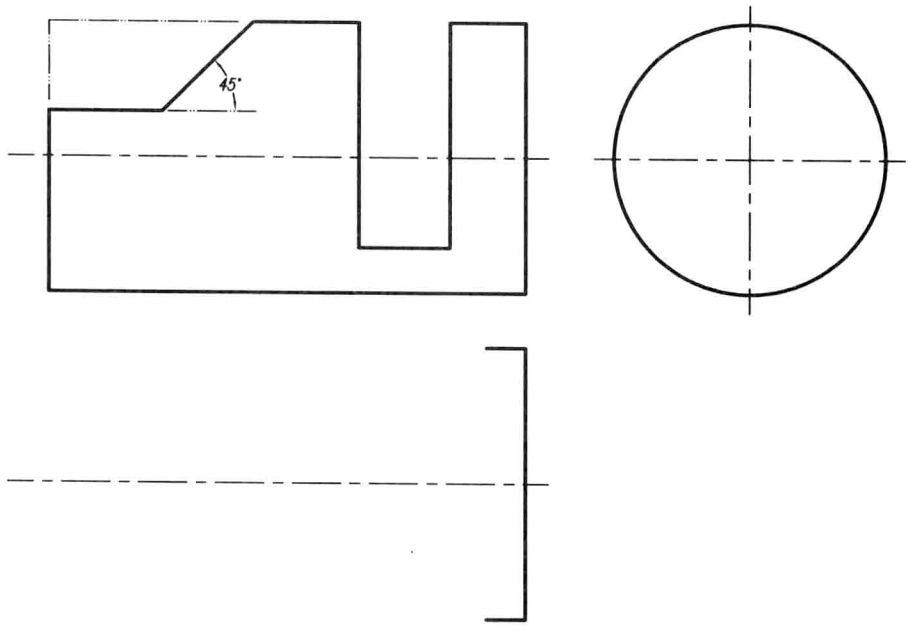
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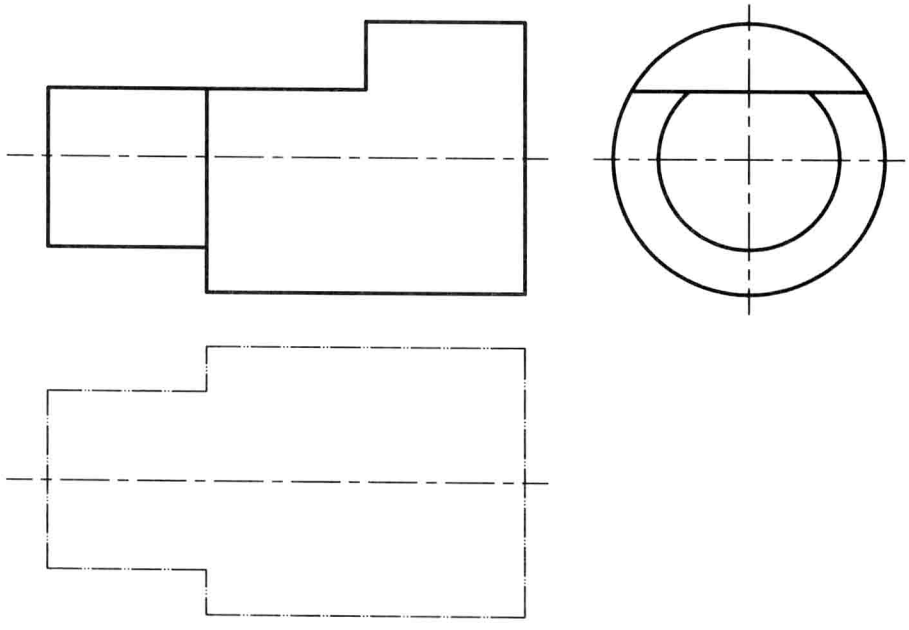
(4)

5-6 完成曲面立体被截切后的三个投影图。

(1)

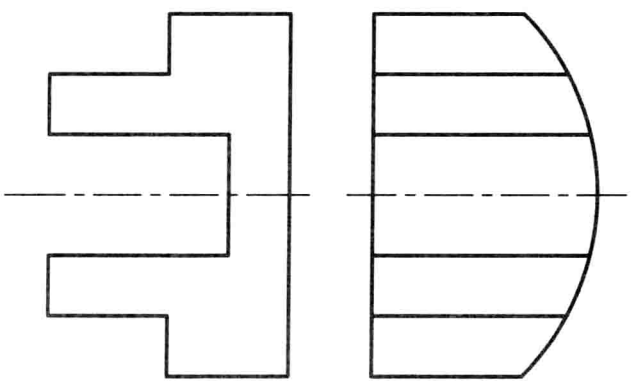


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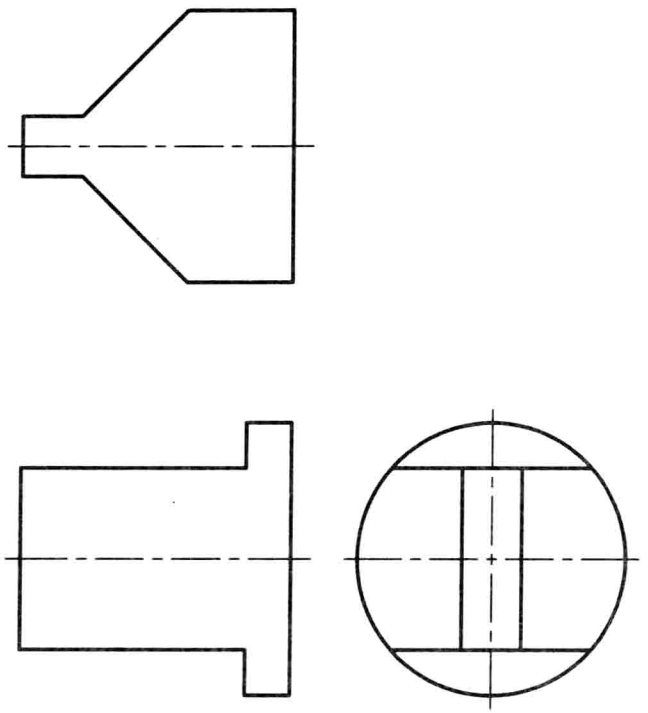


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(3)

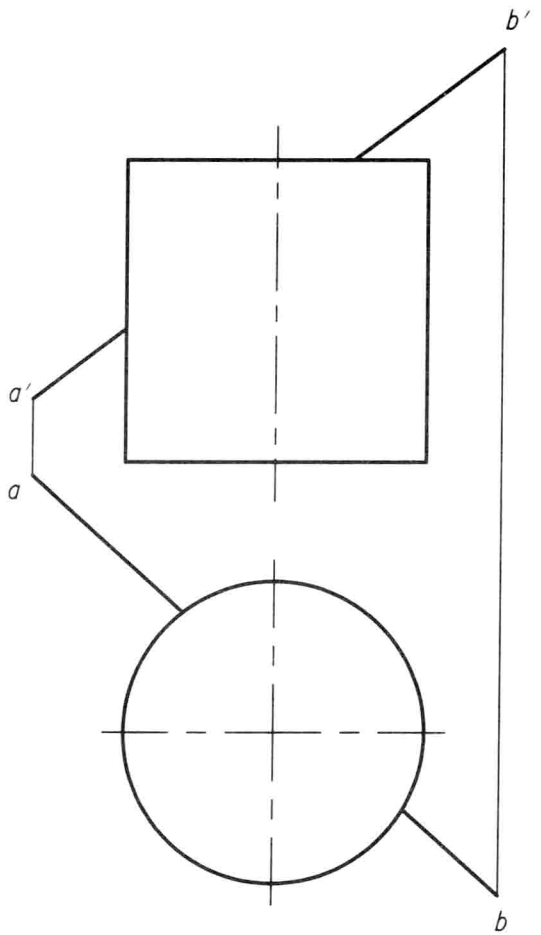


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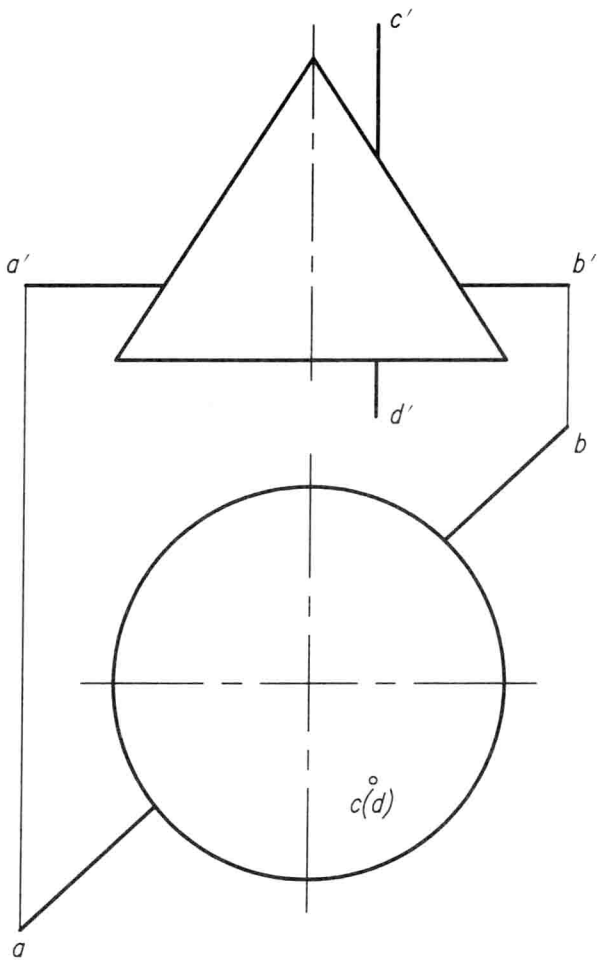


5-7 求直线与曲面立体的交点，并判断可见性。

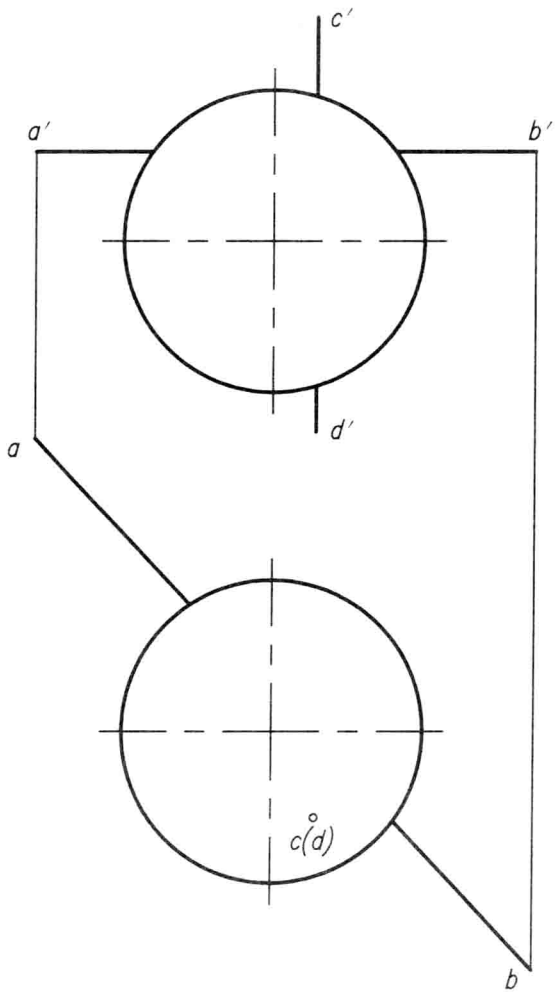
(1)



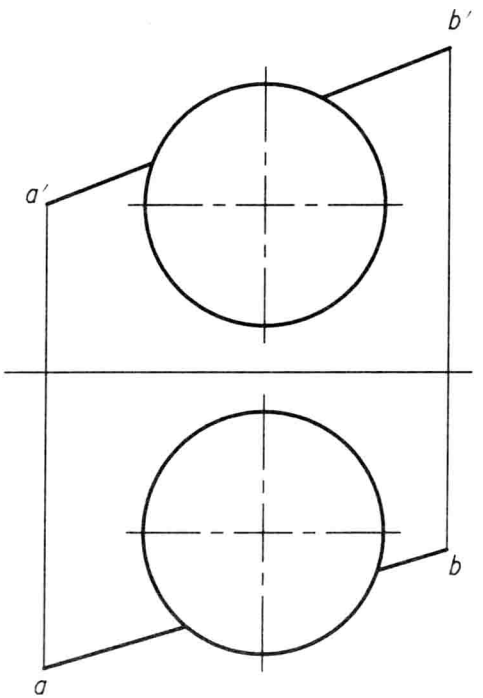
(2)



(3)



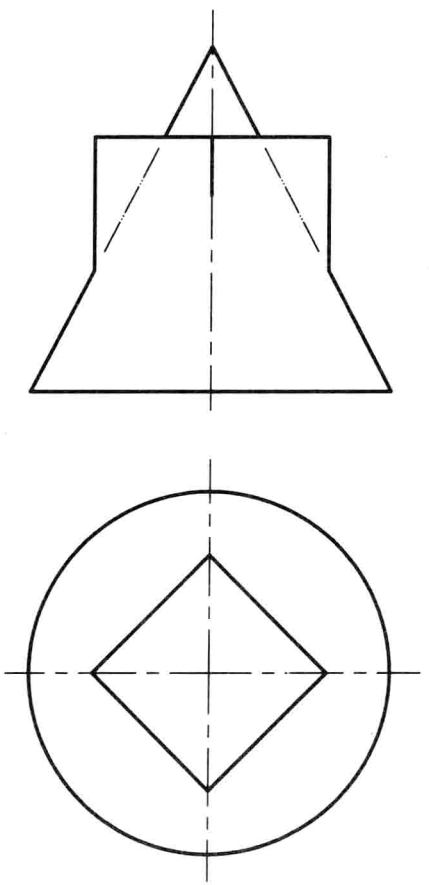
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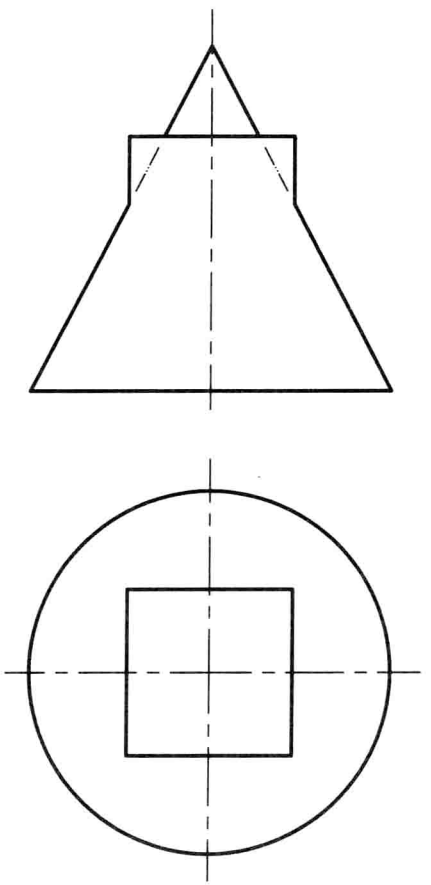
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5-8 求作四棱柱与圆锥的相贯线。

(1)

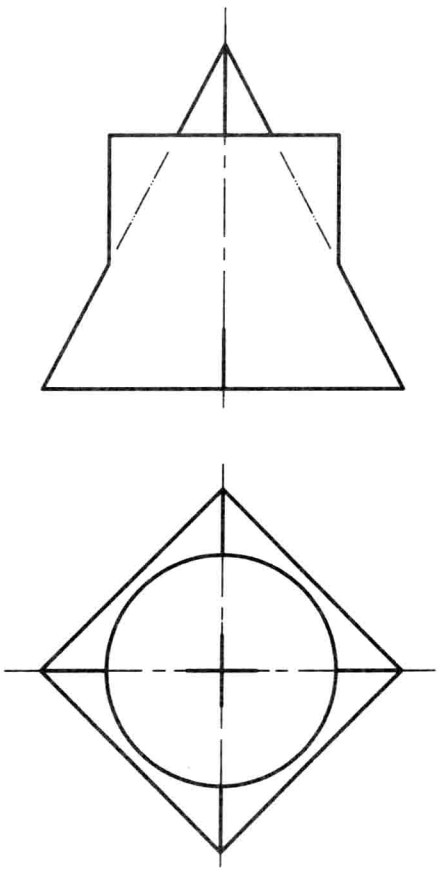


(2)

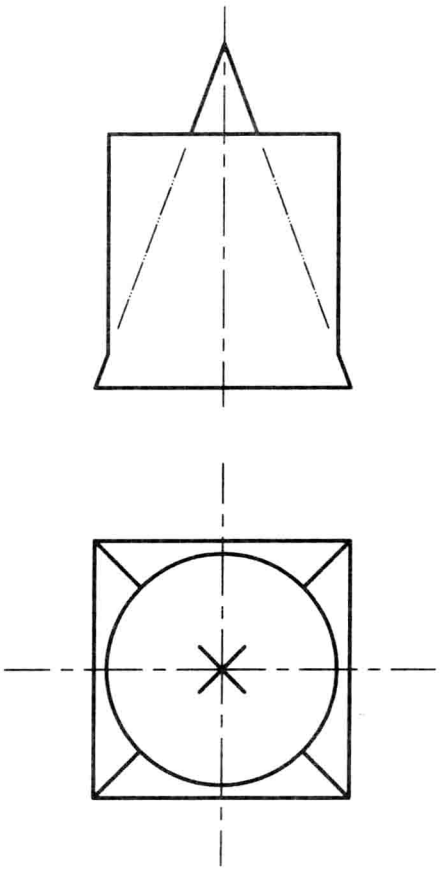


5-9 求作四棱锥与圆柱的相贯线。

(1)

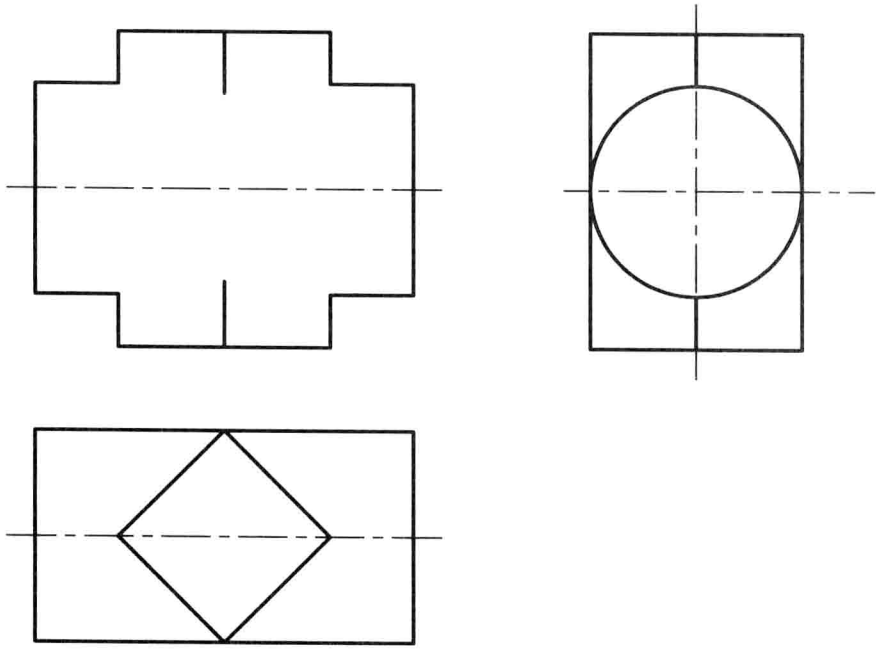


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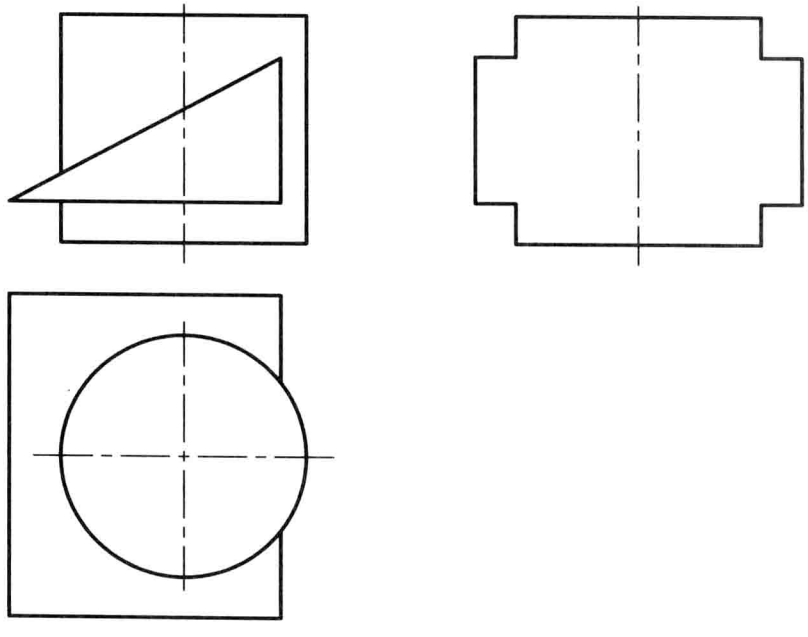


5-10 求作平面立体与圆柱的相贯线。

(1)



(2)

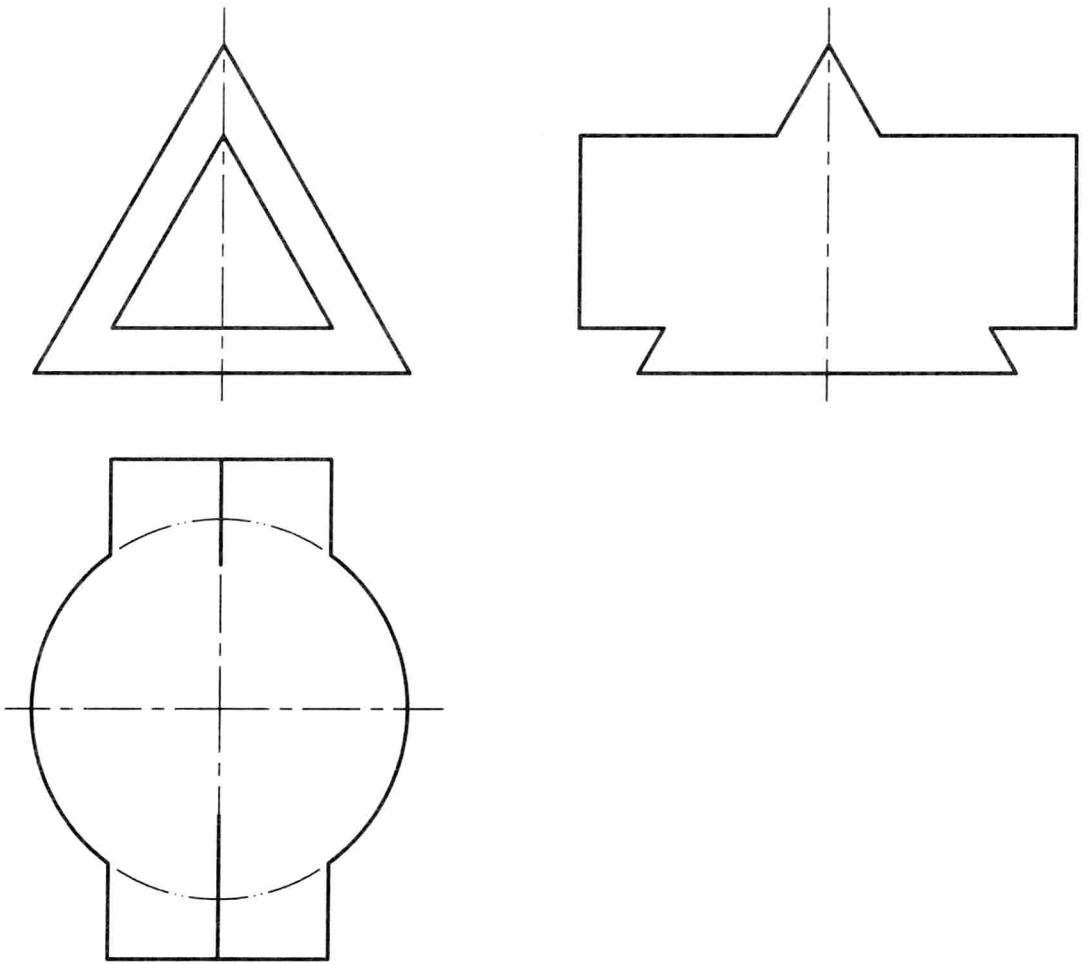


班级

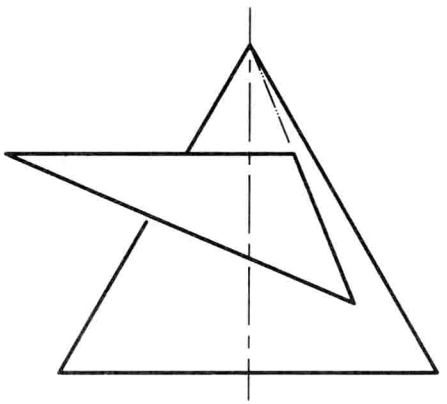
姓名

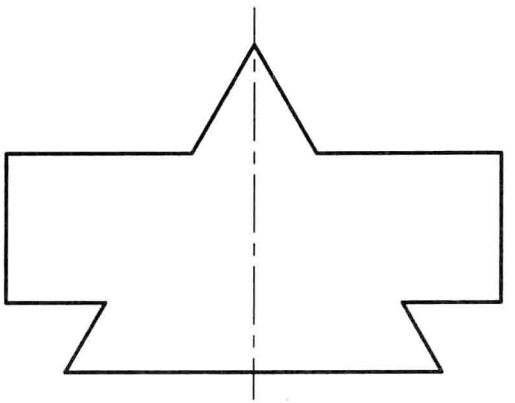
5-11 求作三棱柱与圆锥的相贯线。

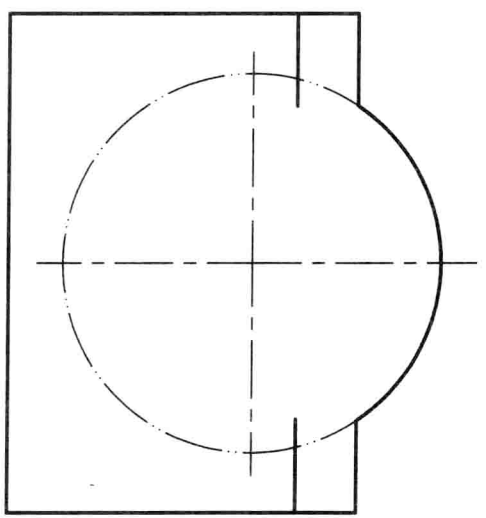
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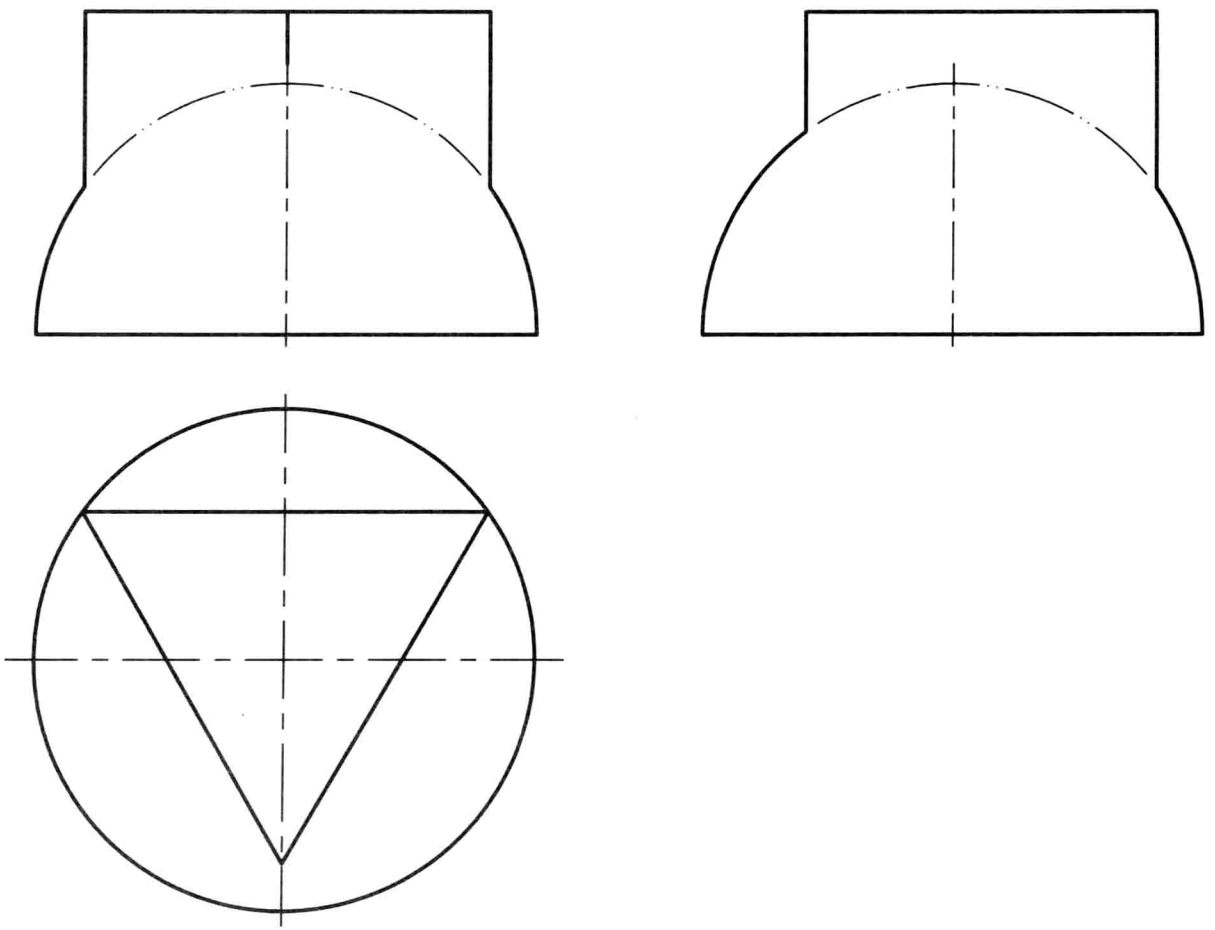
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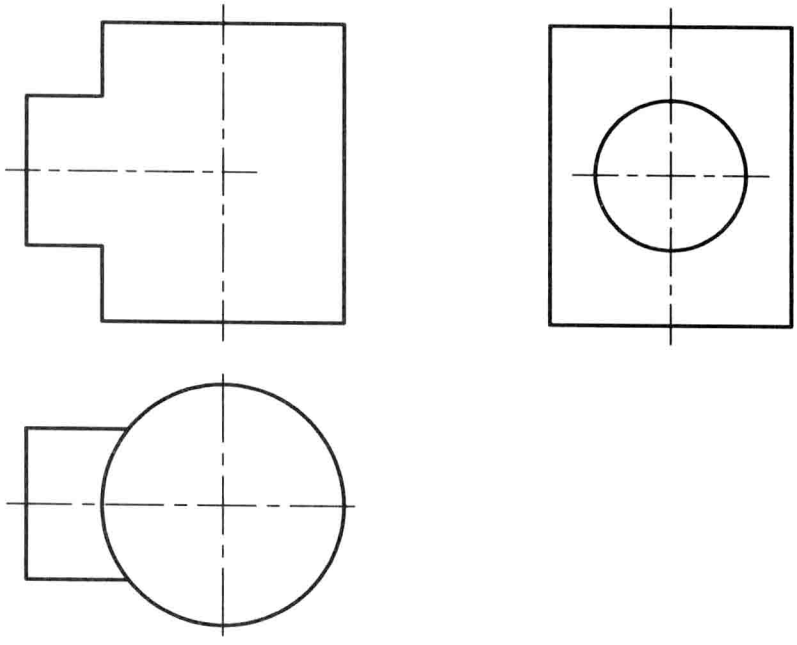




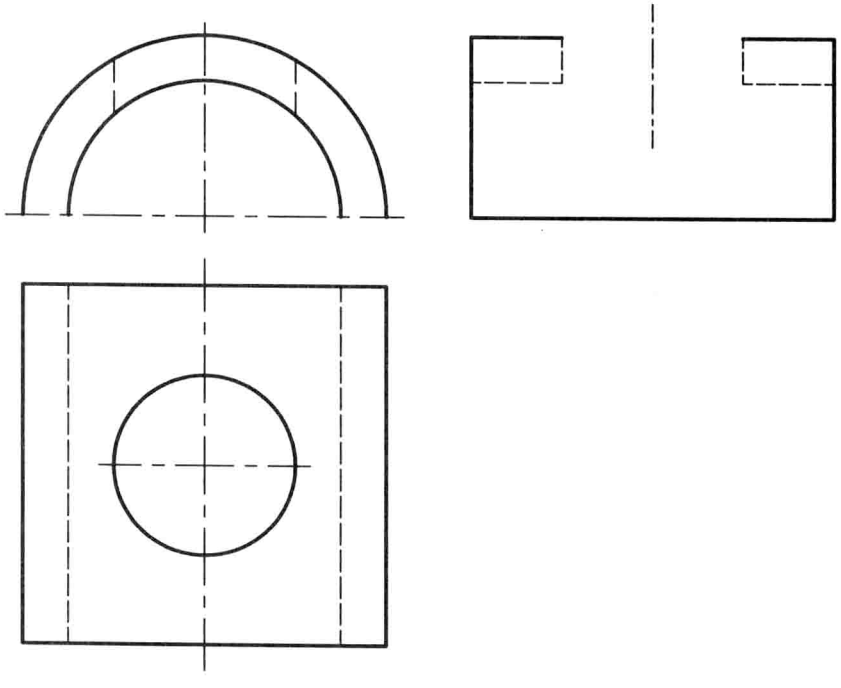
5-12 求作三棱柱与圆球的相贯线。



5-13 求作两正交圆柱的相贯线。



5-14 求作空心圆柱被穿孔后的相贯线。



班级

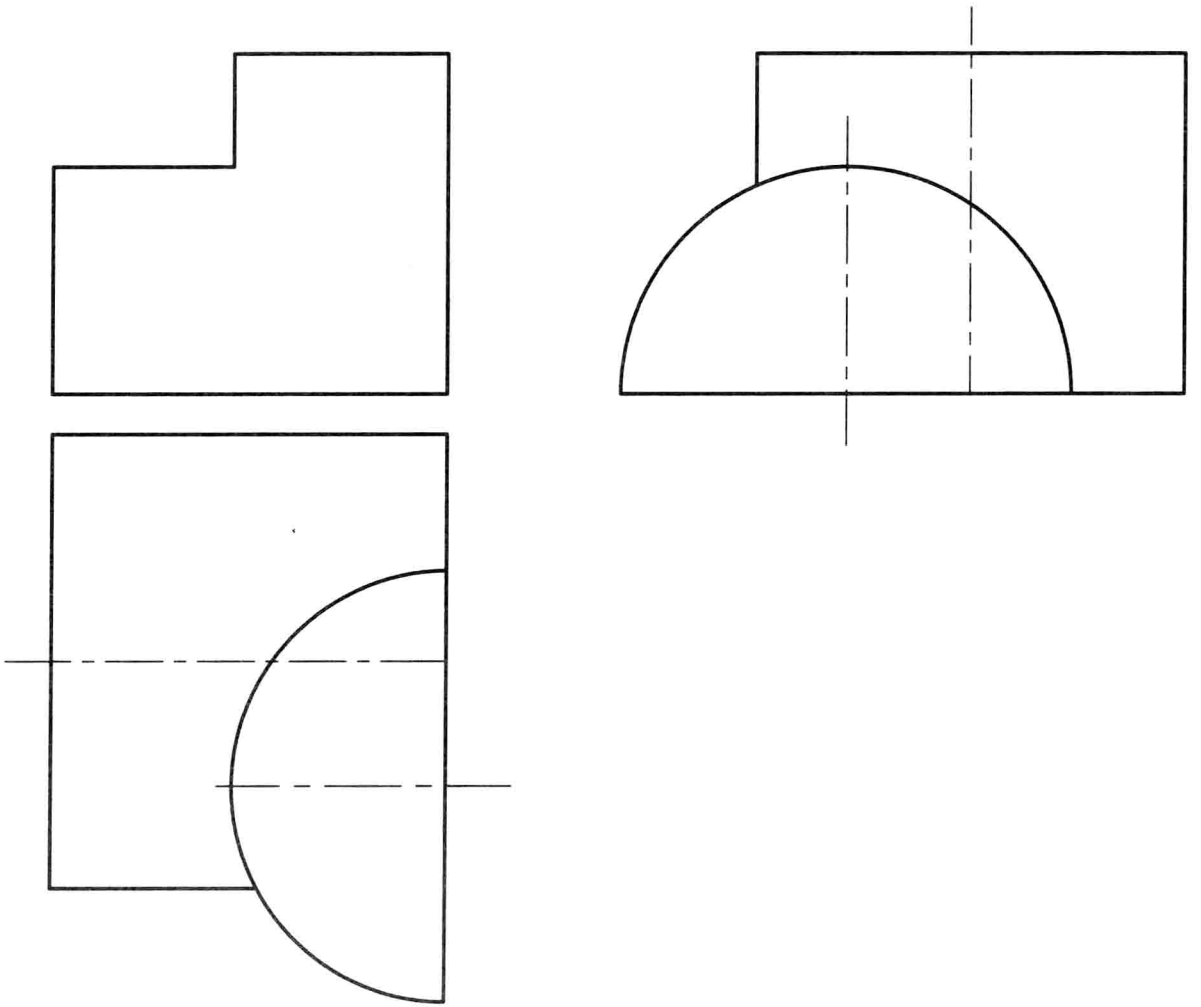
姓名

5-15 求作两等径圆柱的相贯线。

(1)

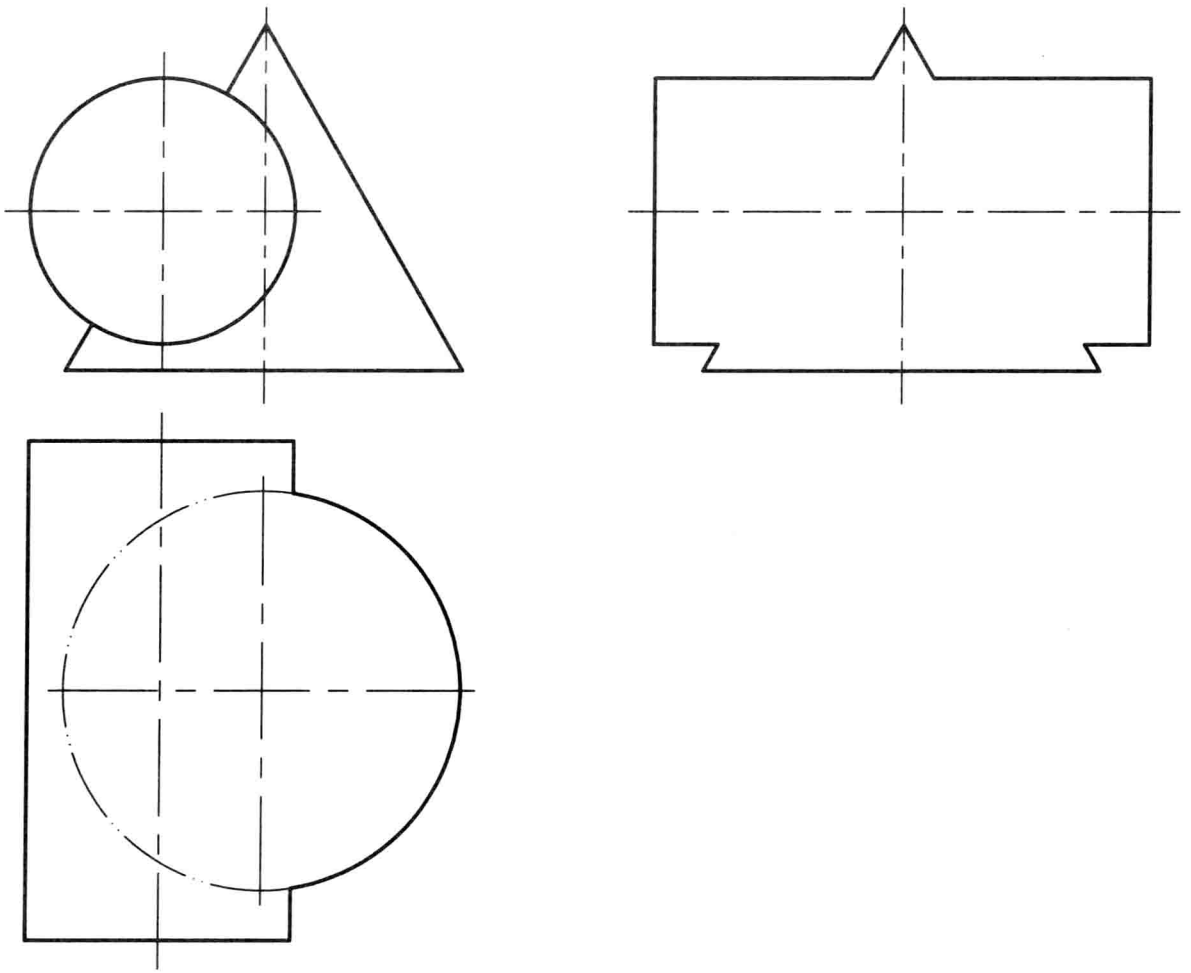
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5-16 求作两半圆柱的相贯线。

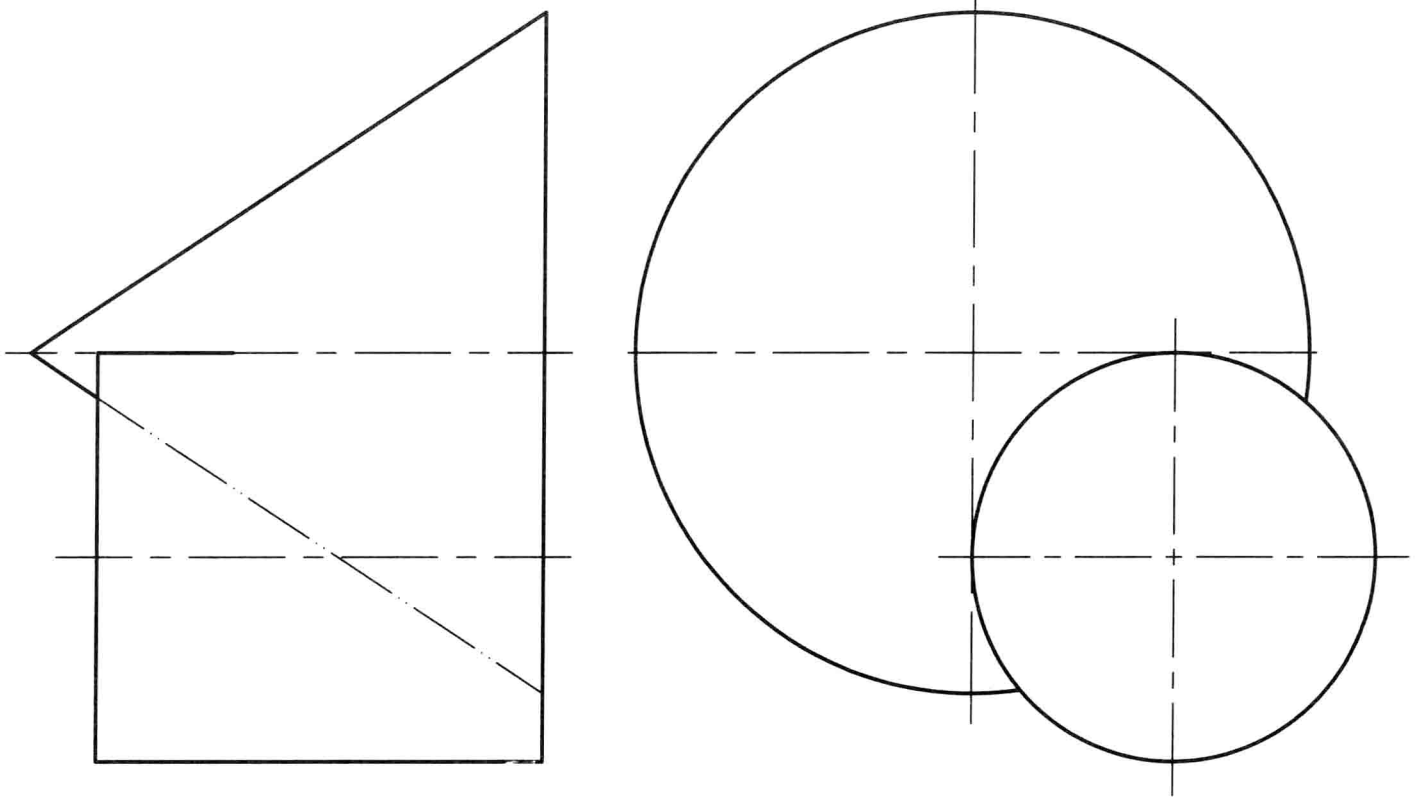


5-17 求作圆柱与圆锥的相贯线。

(1)

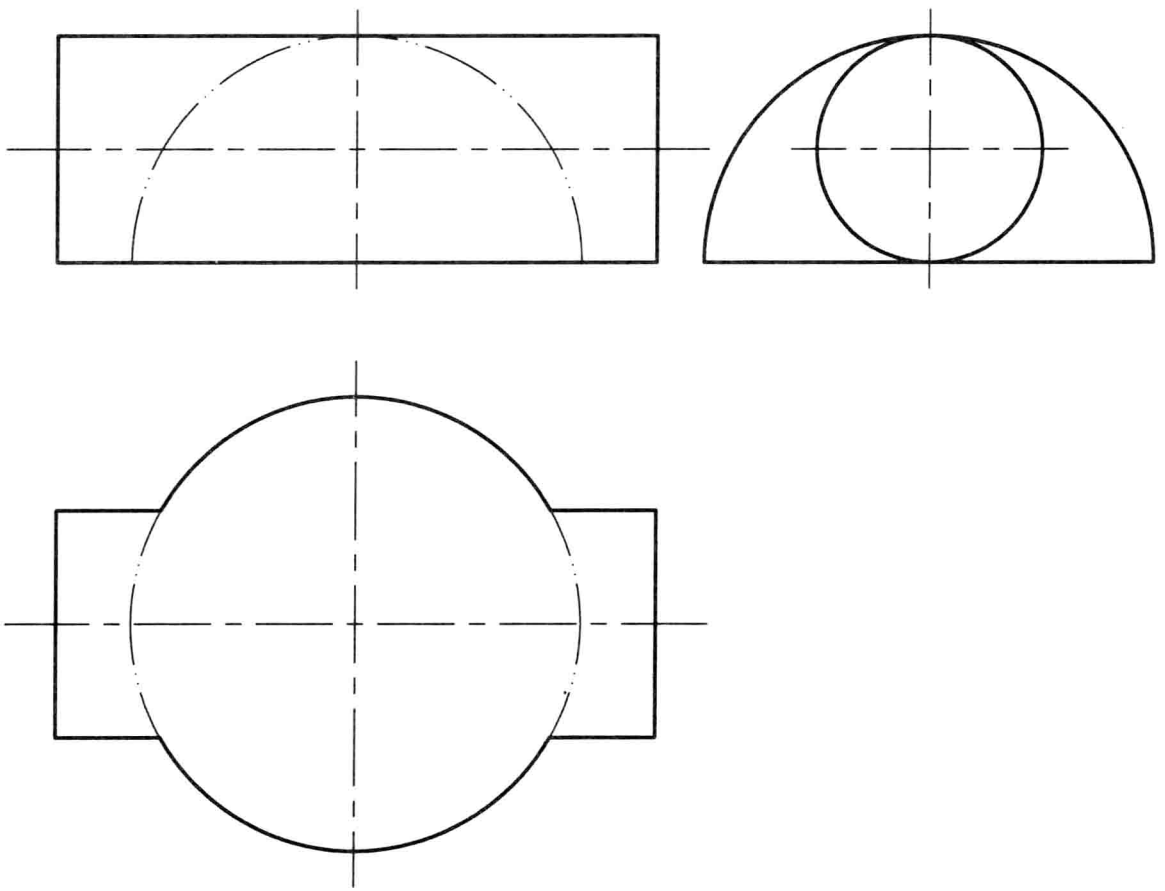


班级　　姓名



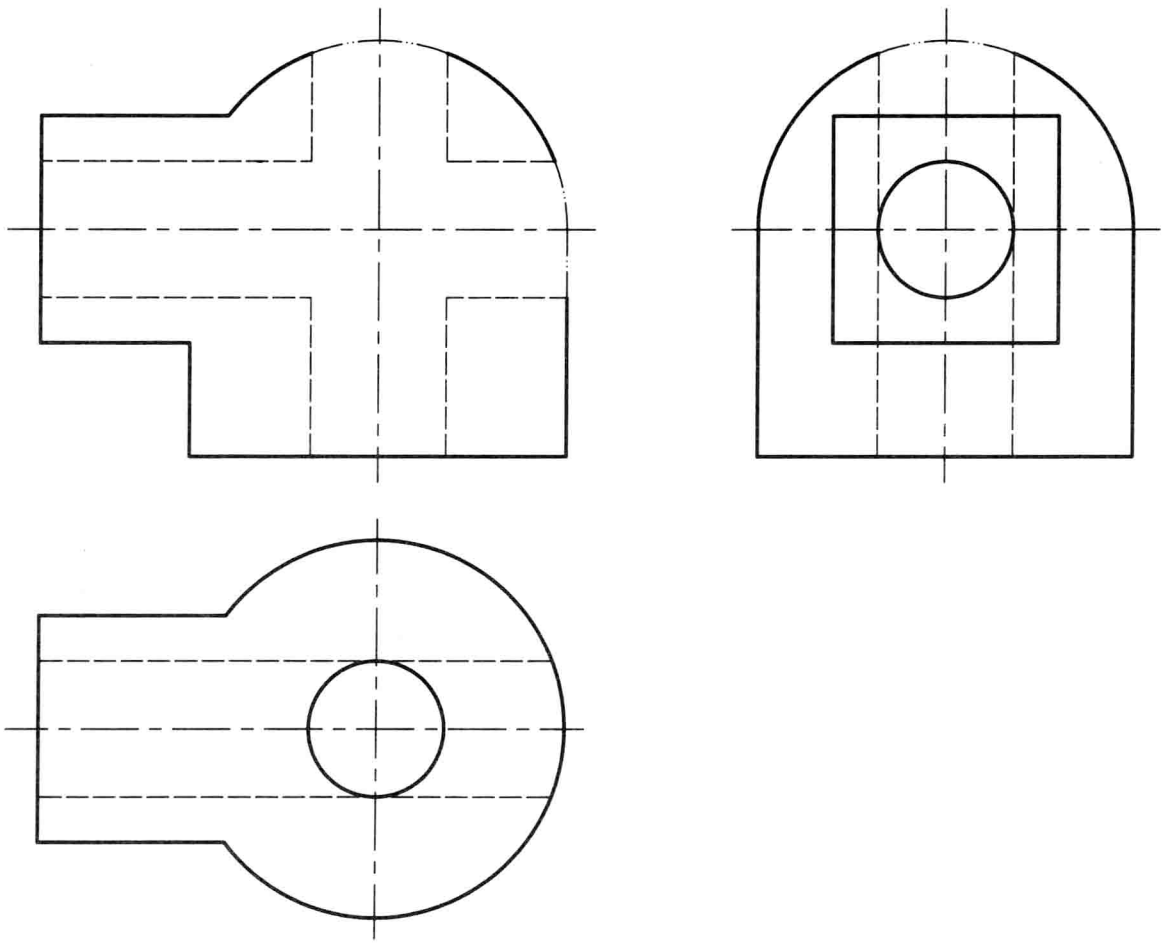
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5-18 求作半圆球与圆柱的相贯线。



班级　　姓名

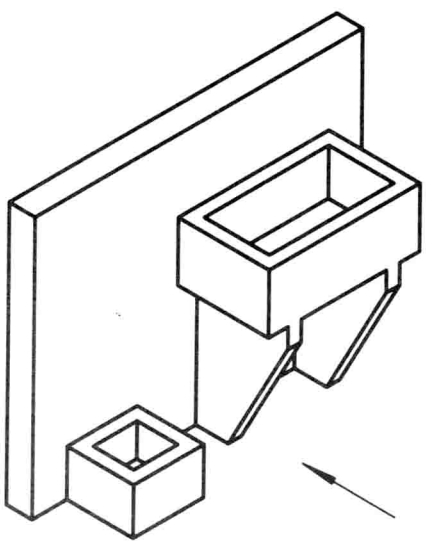
5-19 补全形体的三面投影。



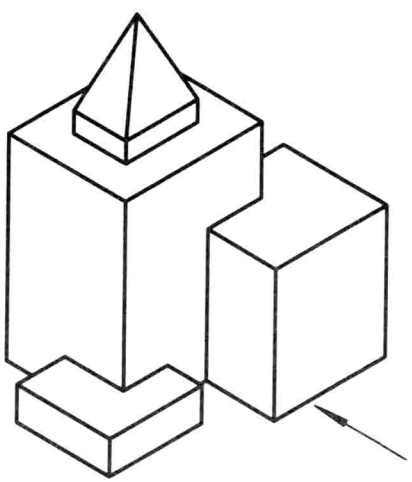
班级　　姓名

6-1 根据形体的立体图，画出其三视图。(尺寸从立体图中量取)

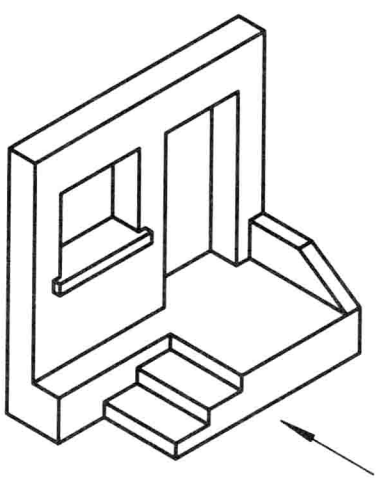
(1)



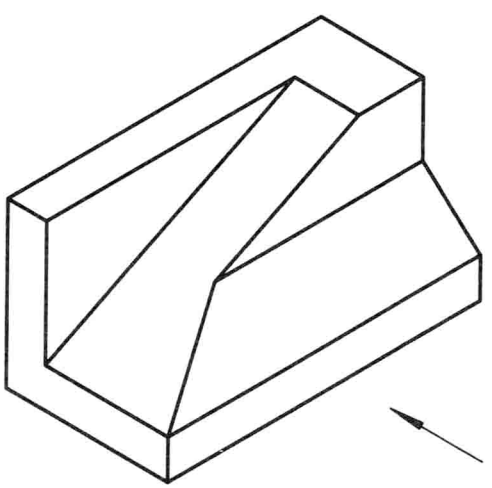
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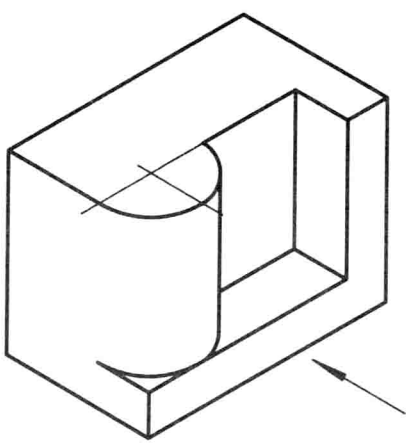
(3)



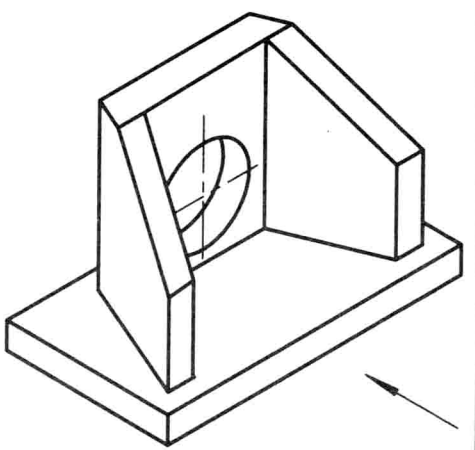
(4)



(5)



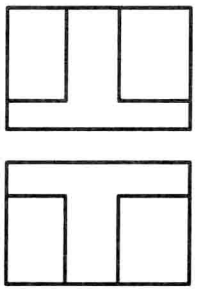
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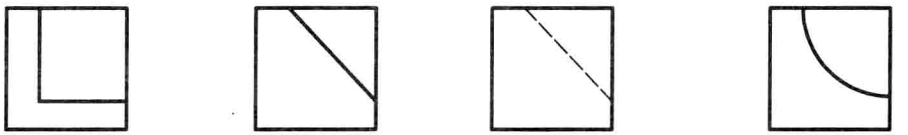


班级　　姓名

6-2 已知形体的两视图，从备选答案中选择正确的第三视图。

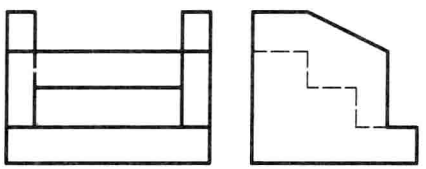
(1)

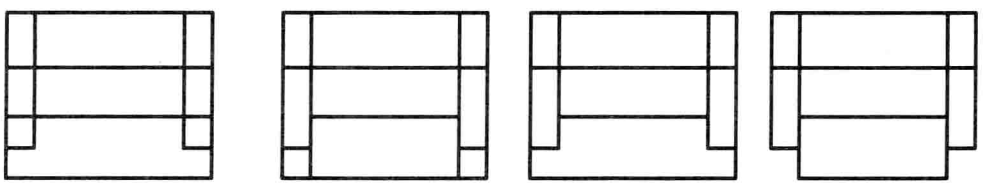




(a)　(b)　(c)　(d)

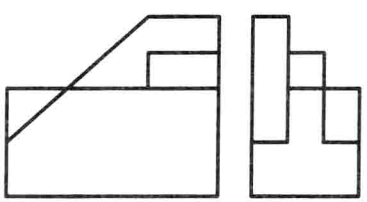
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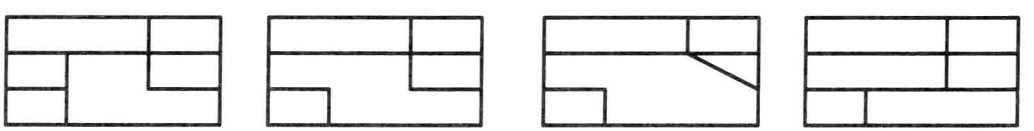




(a)　(b)　(c)　(d)

(3)



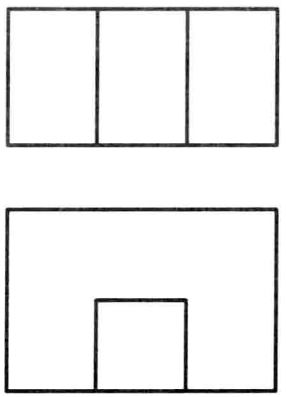


(a)　(b)　(c)　(d)

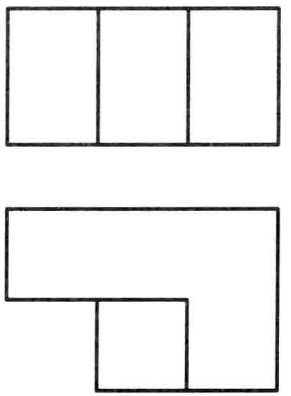
班级　　姓名

6-3 已知形体的两视图，求作第三视图。

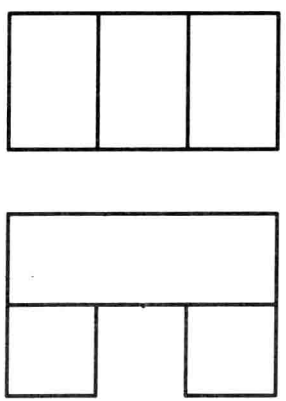
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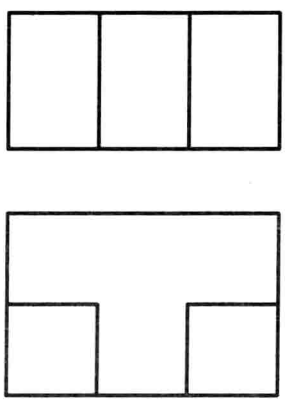
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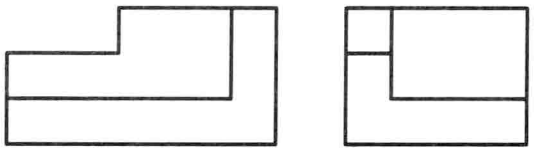
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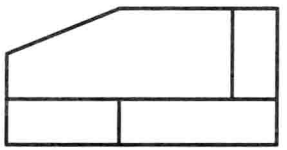
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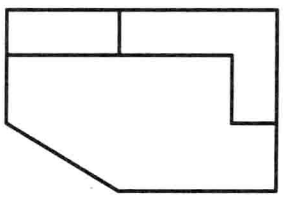


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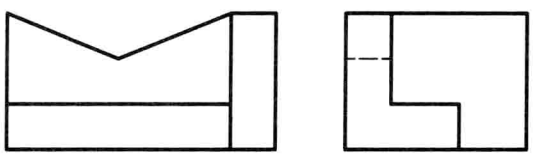


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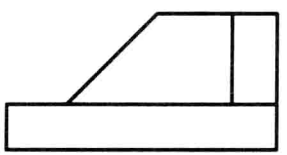


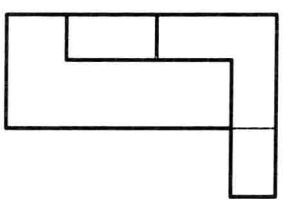


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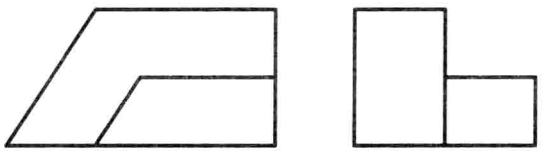


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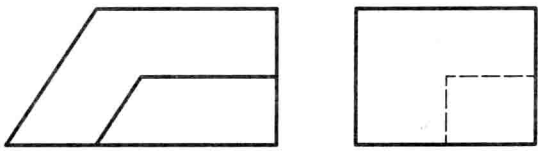




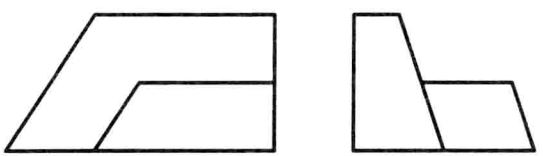
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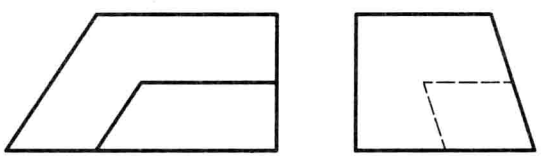
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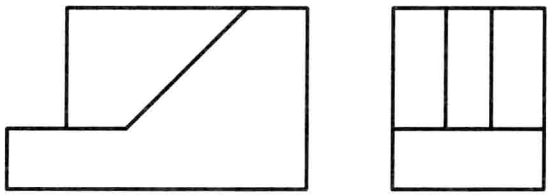
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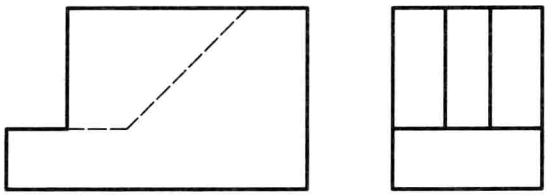
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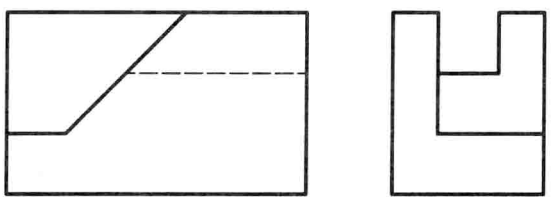
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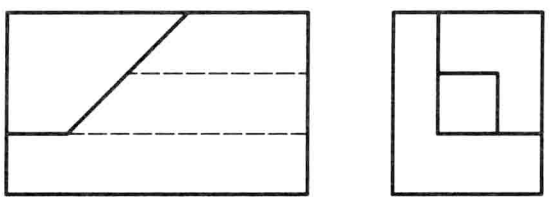
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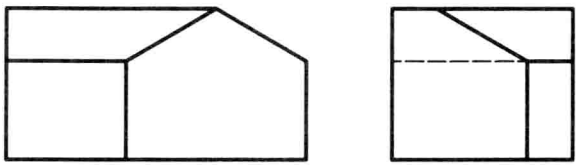
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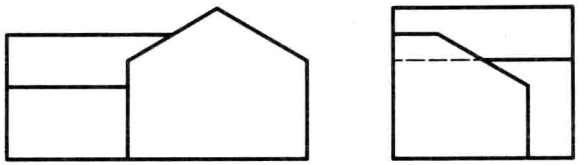
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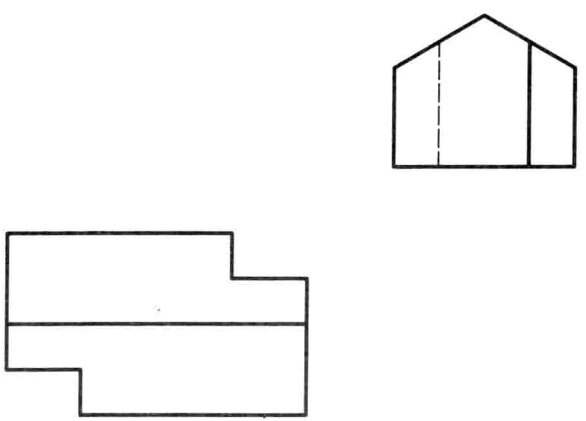
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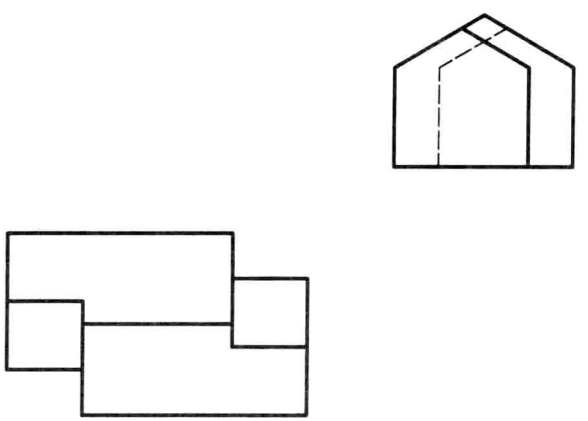
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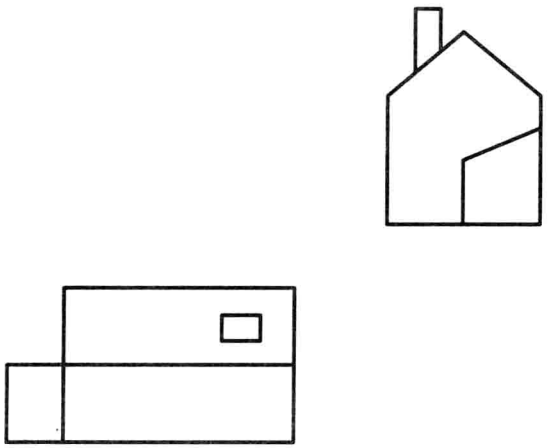
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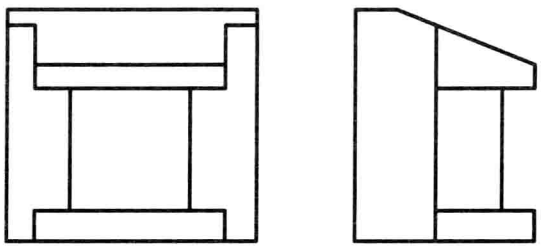
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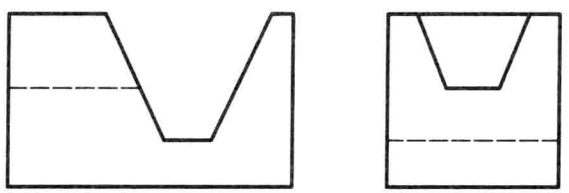
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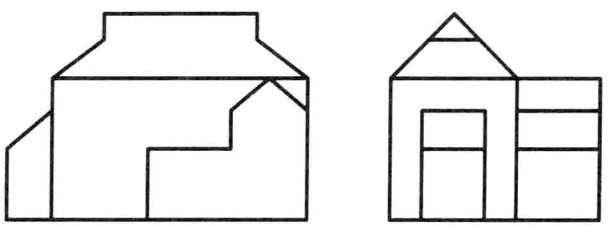
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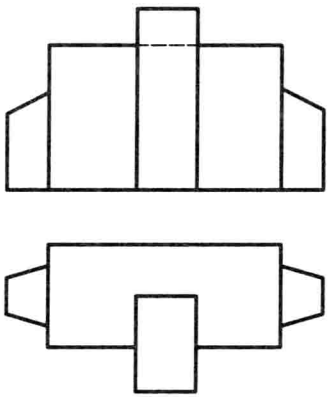
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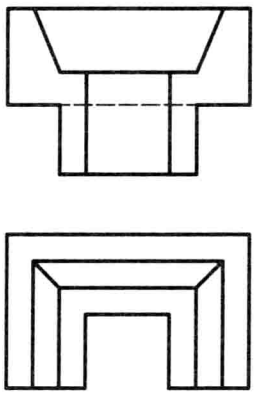
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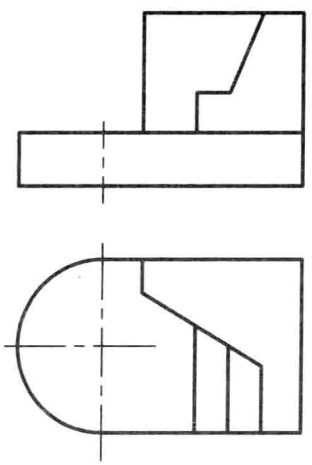
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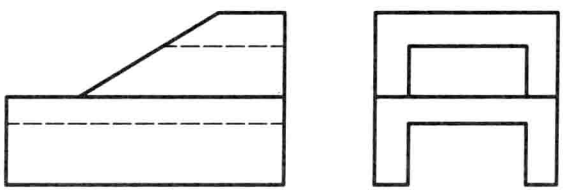
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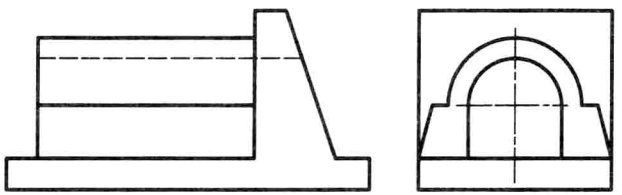
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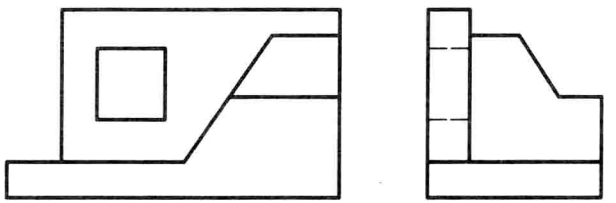
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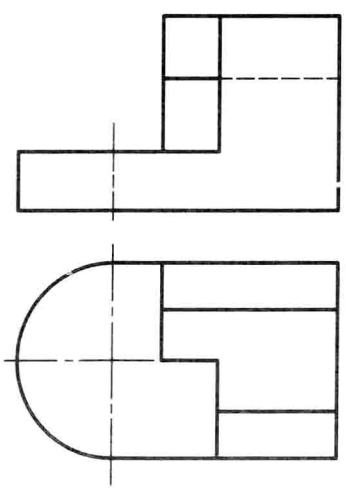
(29)



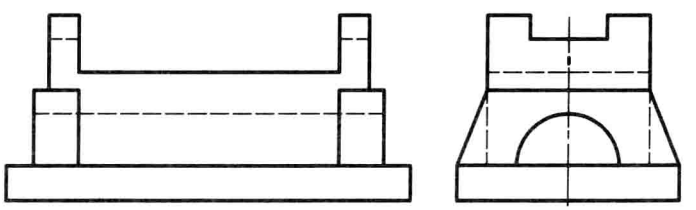
(30)



(31)

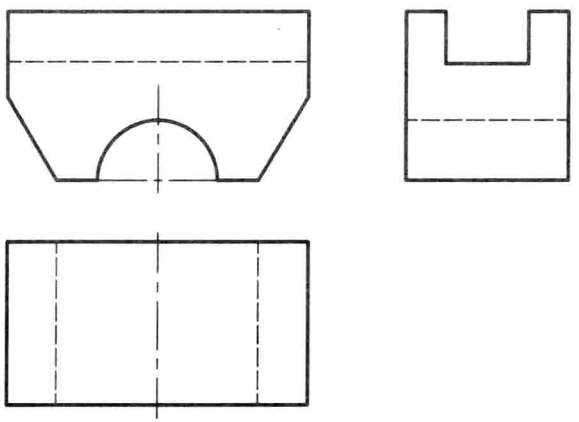


(32)

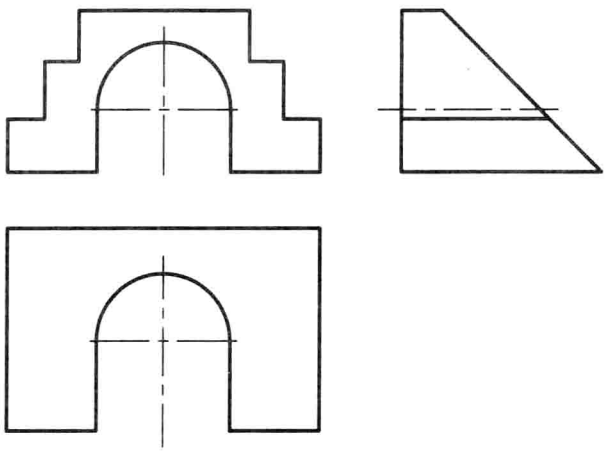


6-4 补画形体视图中缺少的线。

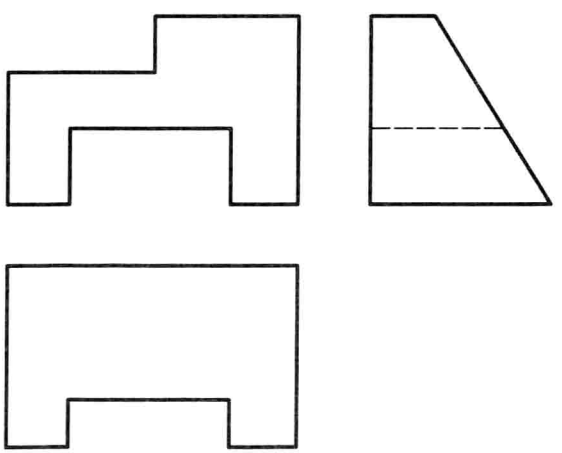
(1)



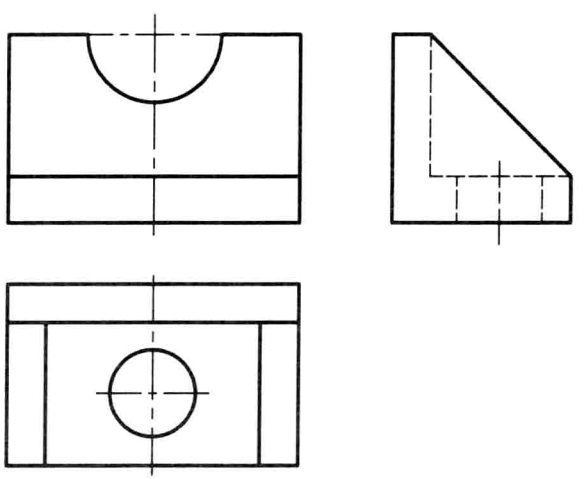
(2)



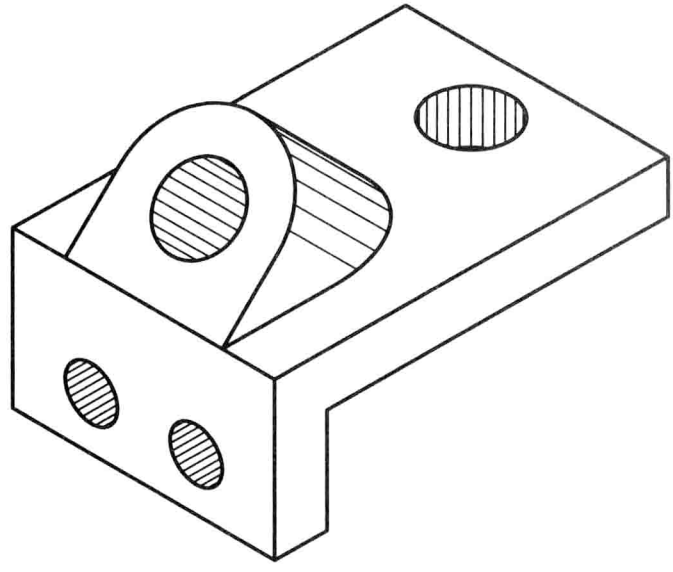
(3)

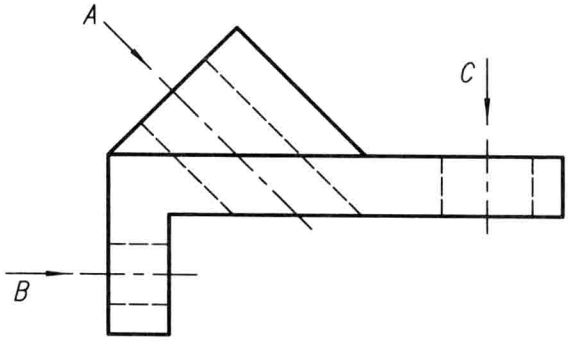


(4)



6-5 根据已给图样，读懂形体后，选一组合适的视图（基本视图、辅助视图）表达形体。





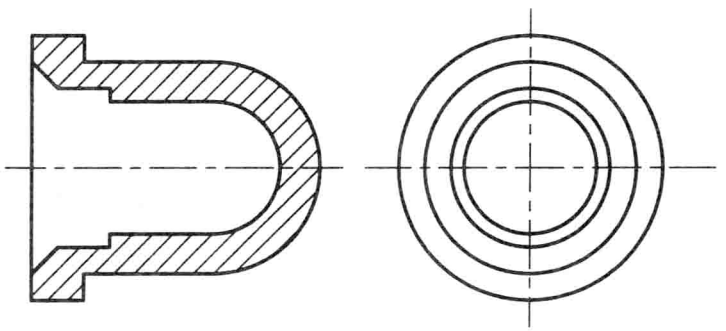
班级

姓名

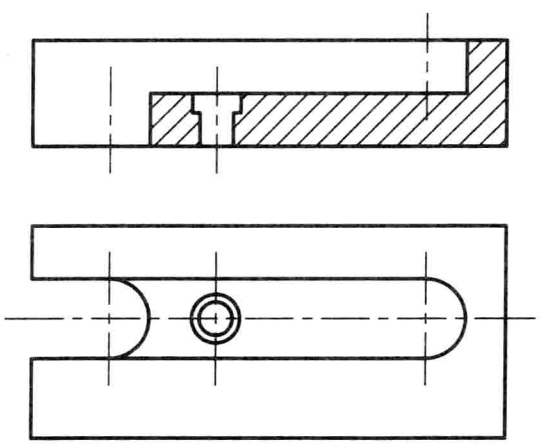
班级 姓名

7-1 找出下列图中的错误。(画错或多线打“×”，缺线补上)

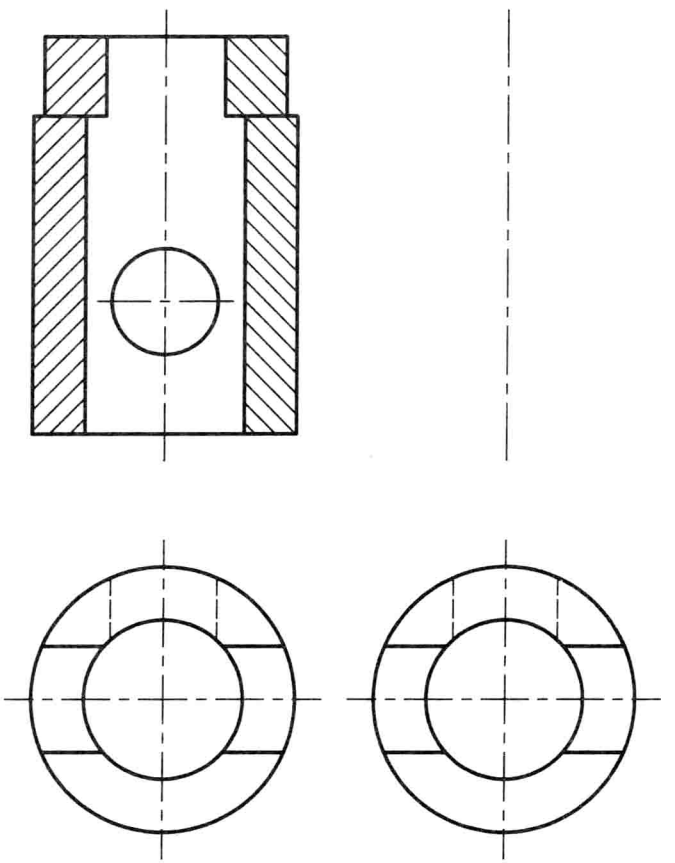
(1)



(2)

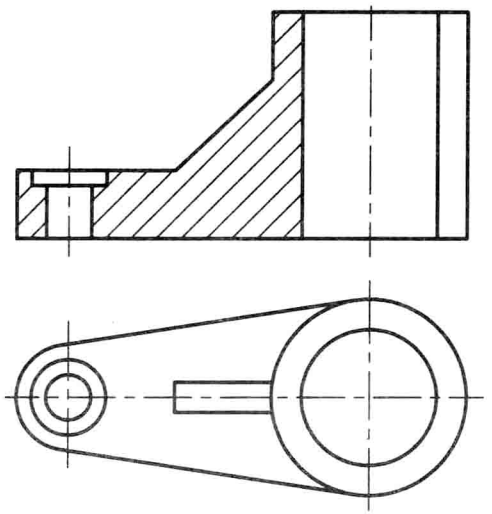


(3)

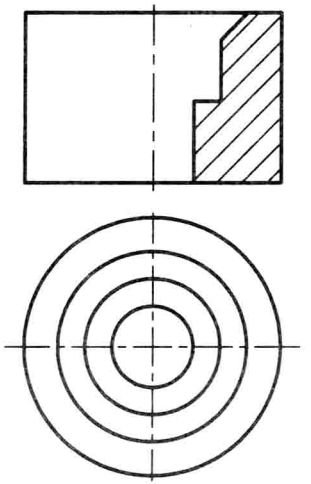


班级　　姓名

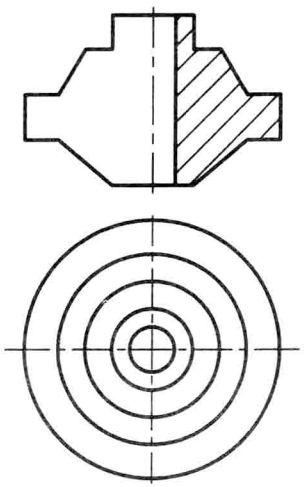
(4)



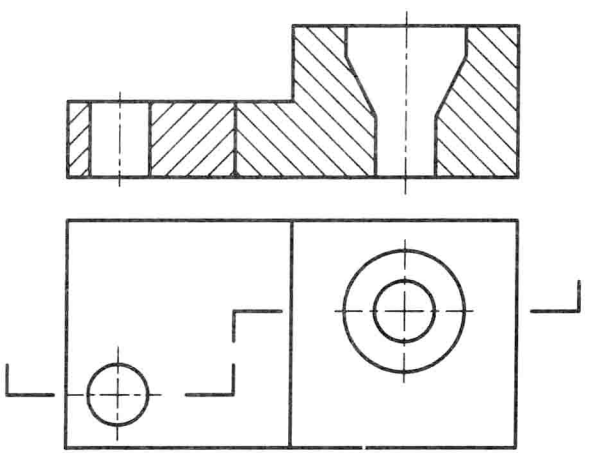
(6)



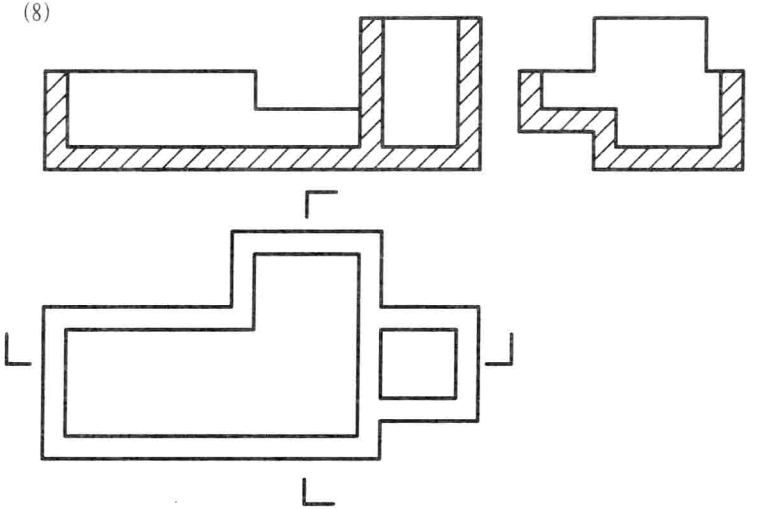
(7)



(5)

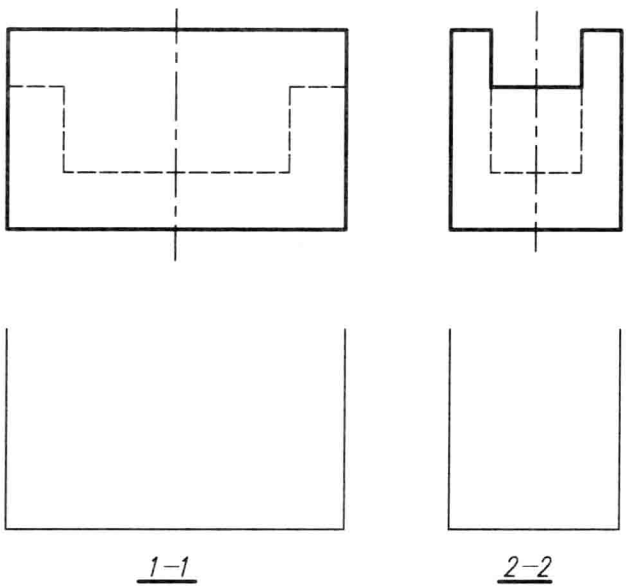


(8)

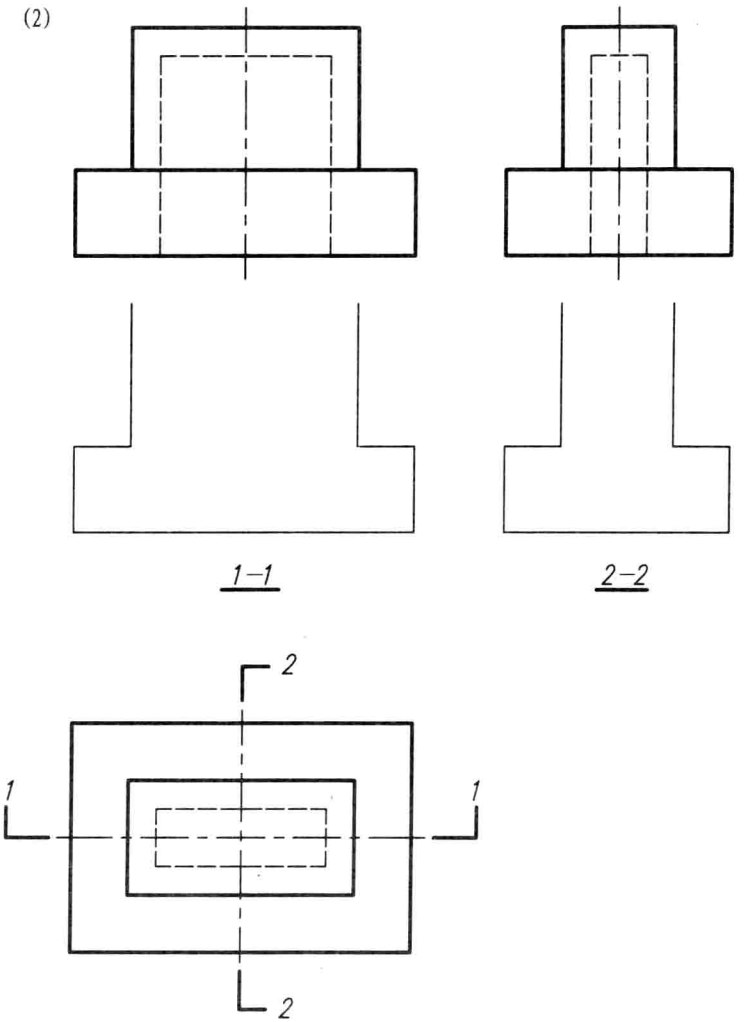


7-2 作下列指定剖切位置的剖面图。

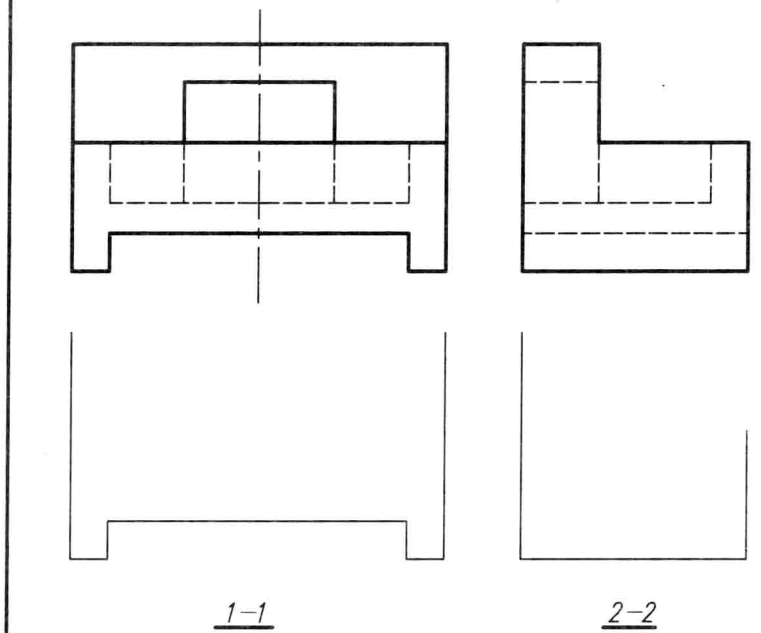
(1)



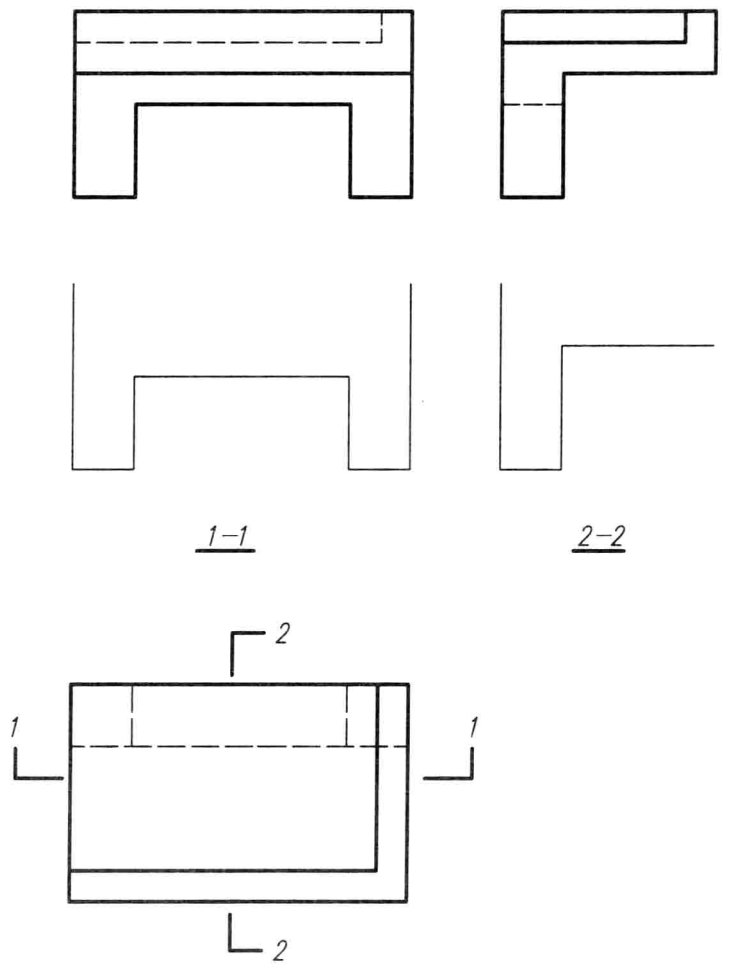
(2)



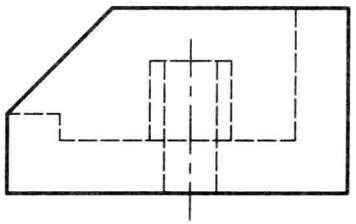
(3)

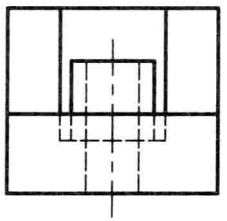


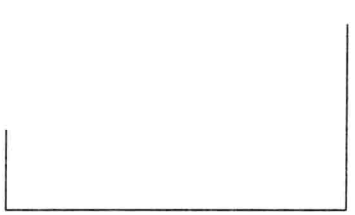
(4)



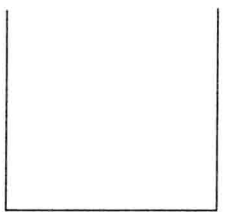
(5)



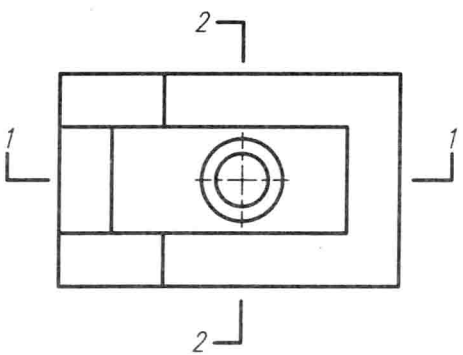




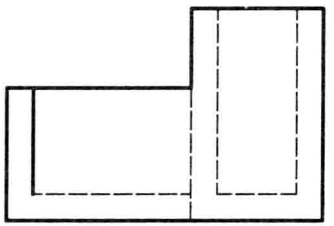
1—1

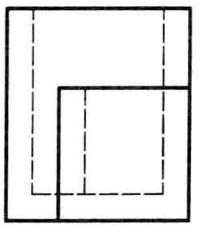


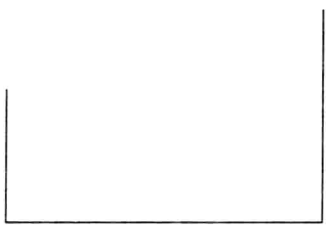
2—2



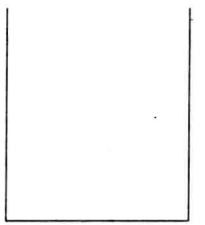
(6)



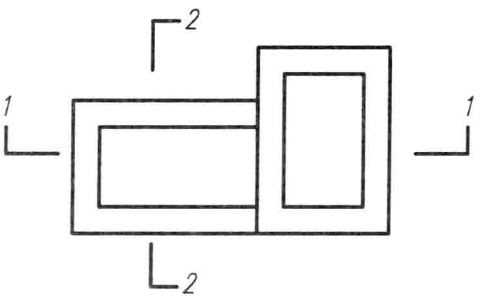




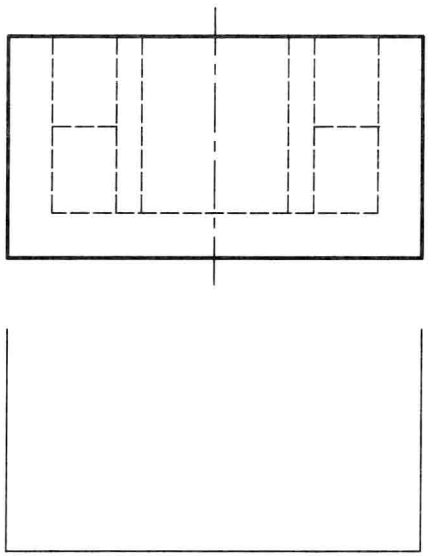
1—1



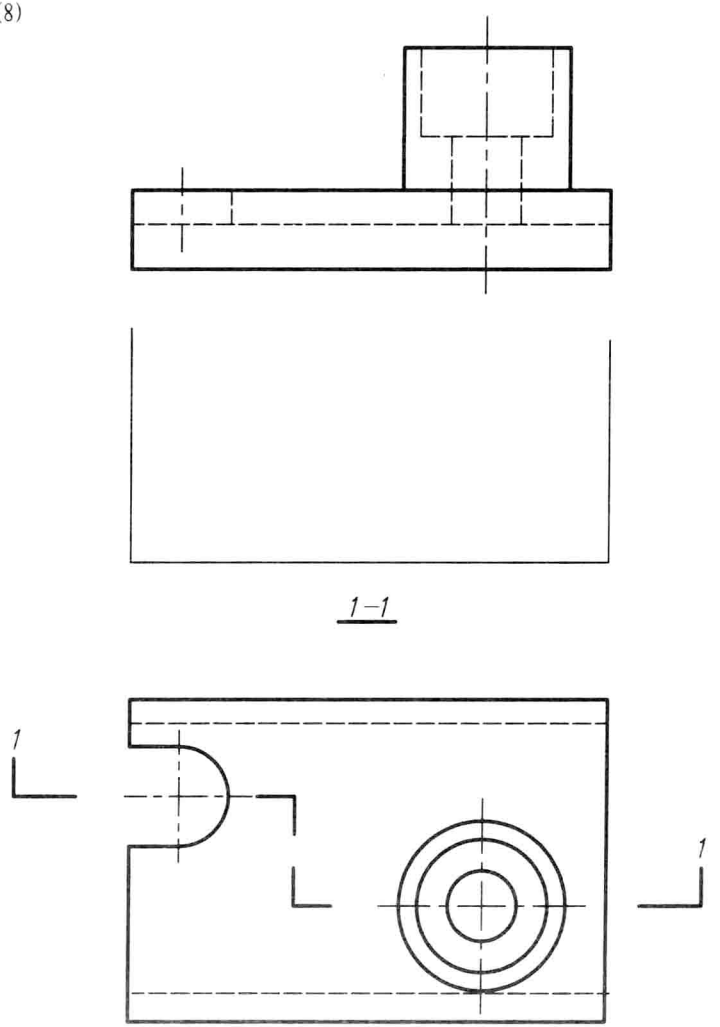
2—2



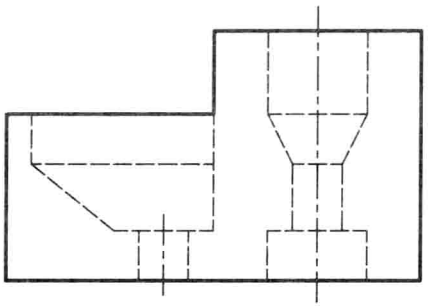
(7)



(8)

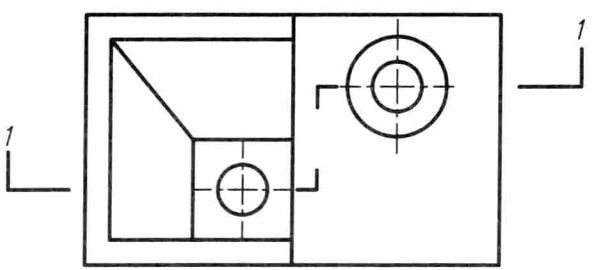


(9)

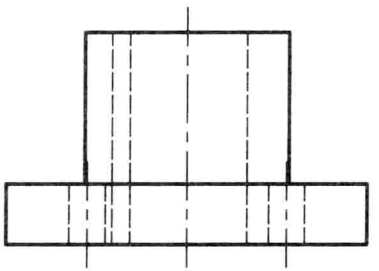


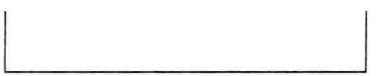


1—1

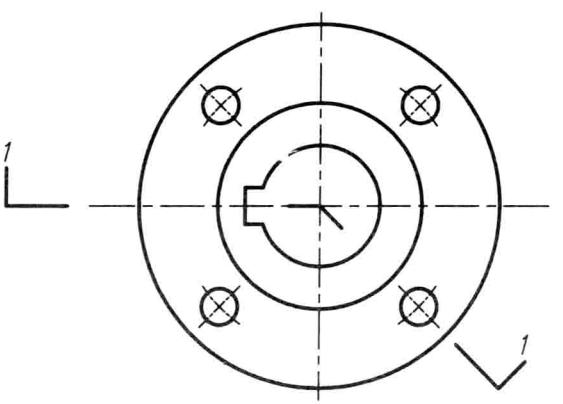


(10)



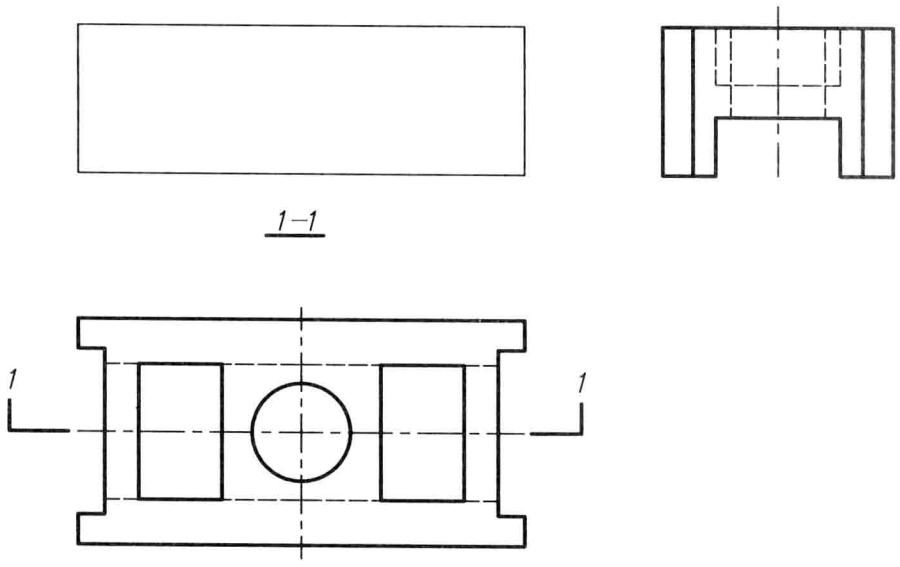


1—1

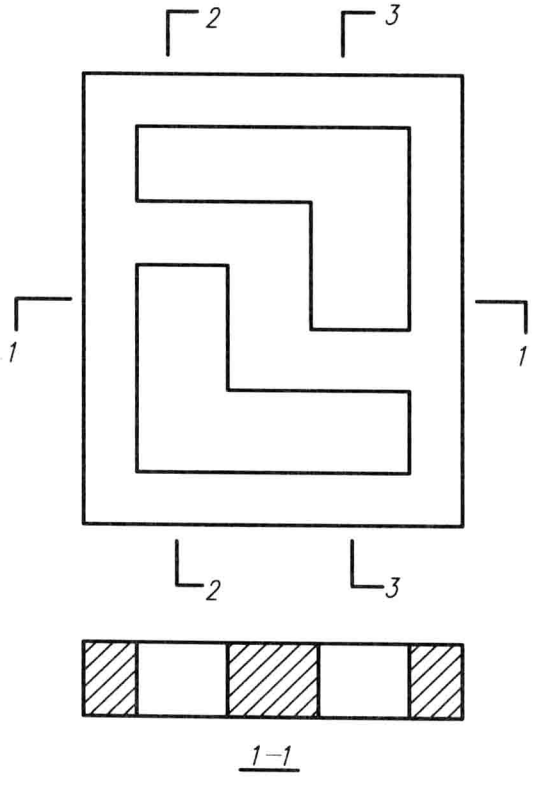


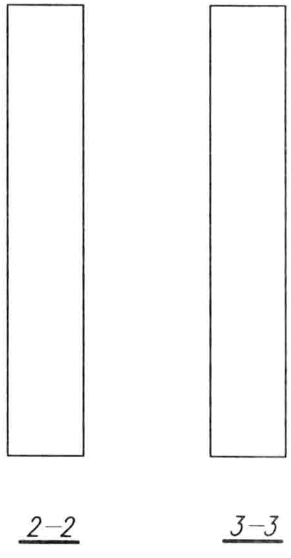
7-3 在指定位置画出所要求的剖面图。

(1)



(2)

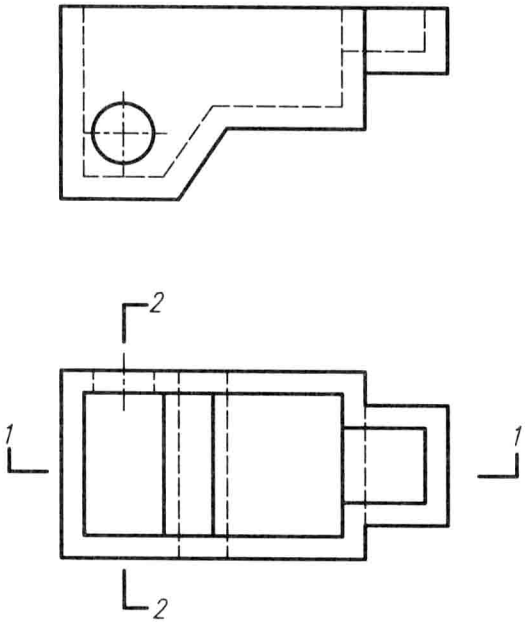


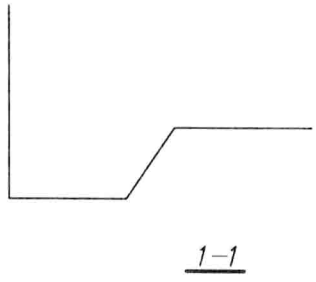


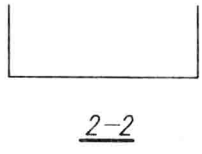
班级

姓名

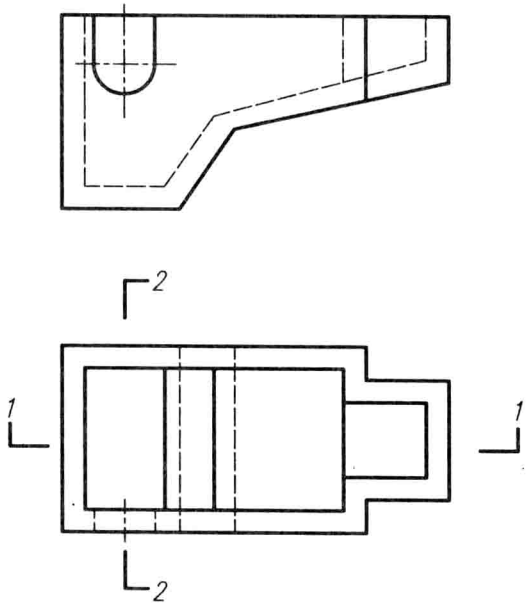
(3)

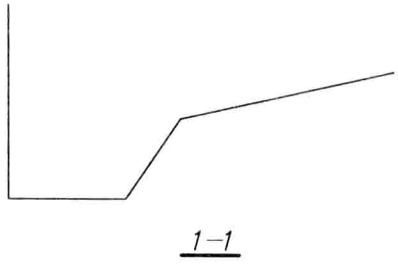


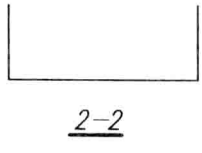




(4)



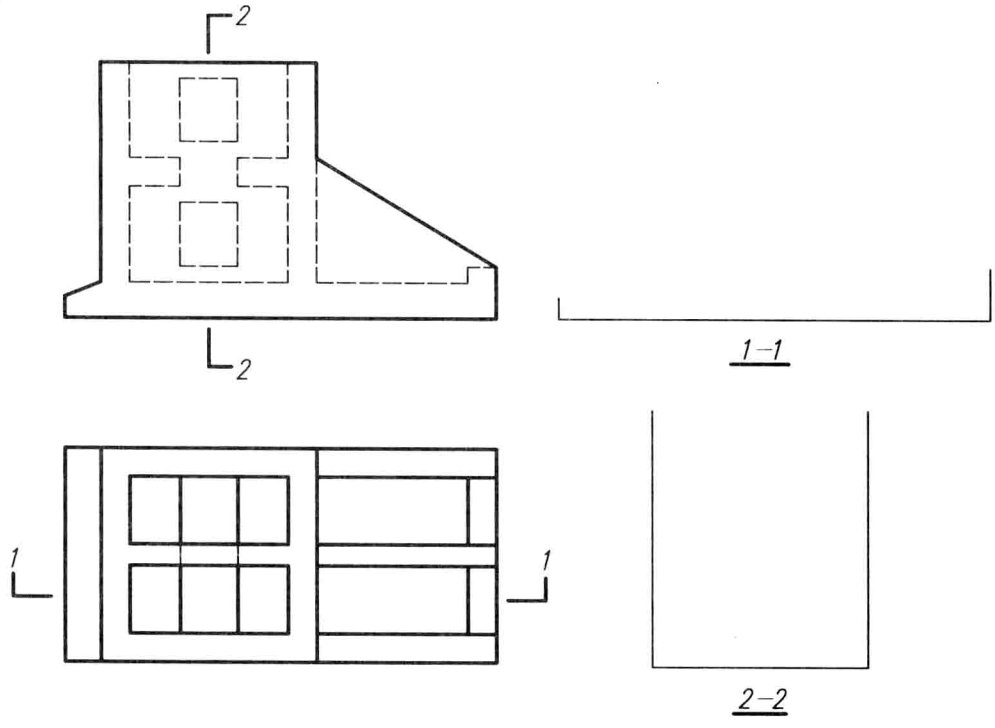




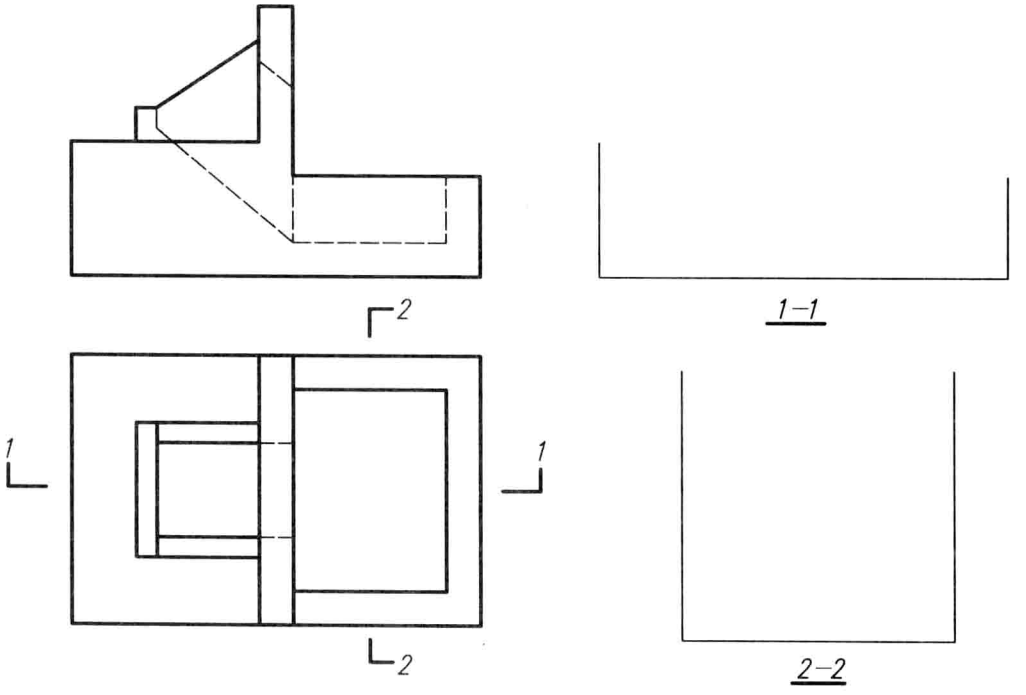
班级

姓名

(5)



(6)

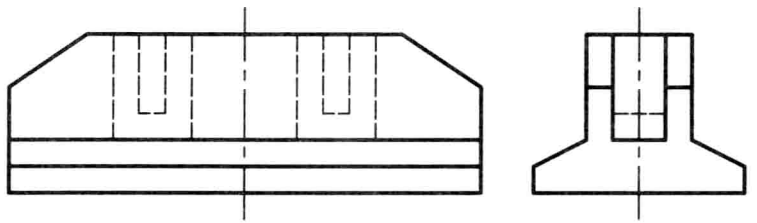


班级

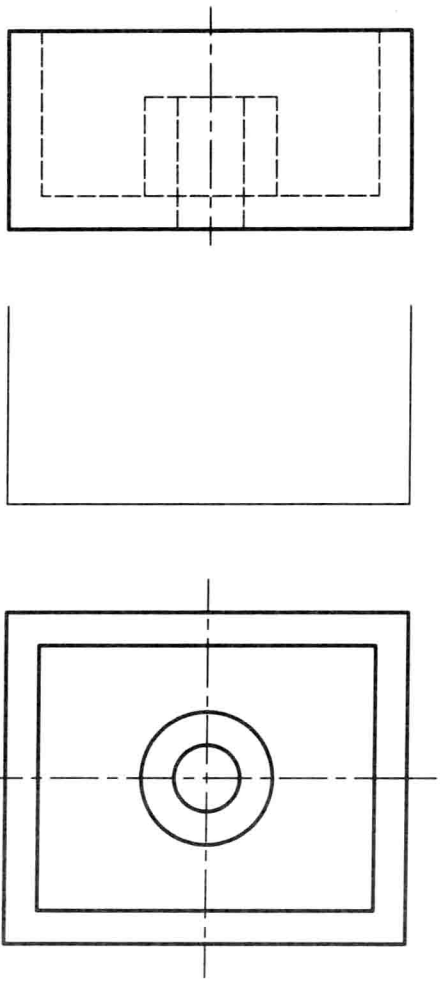
姓名

7-4 读懂下列形体，将正立面图改为半剖面图。

(1)

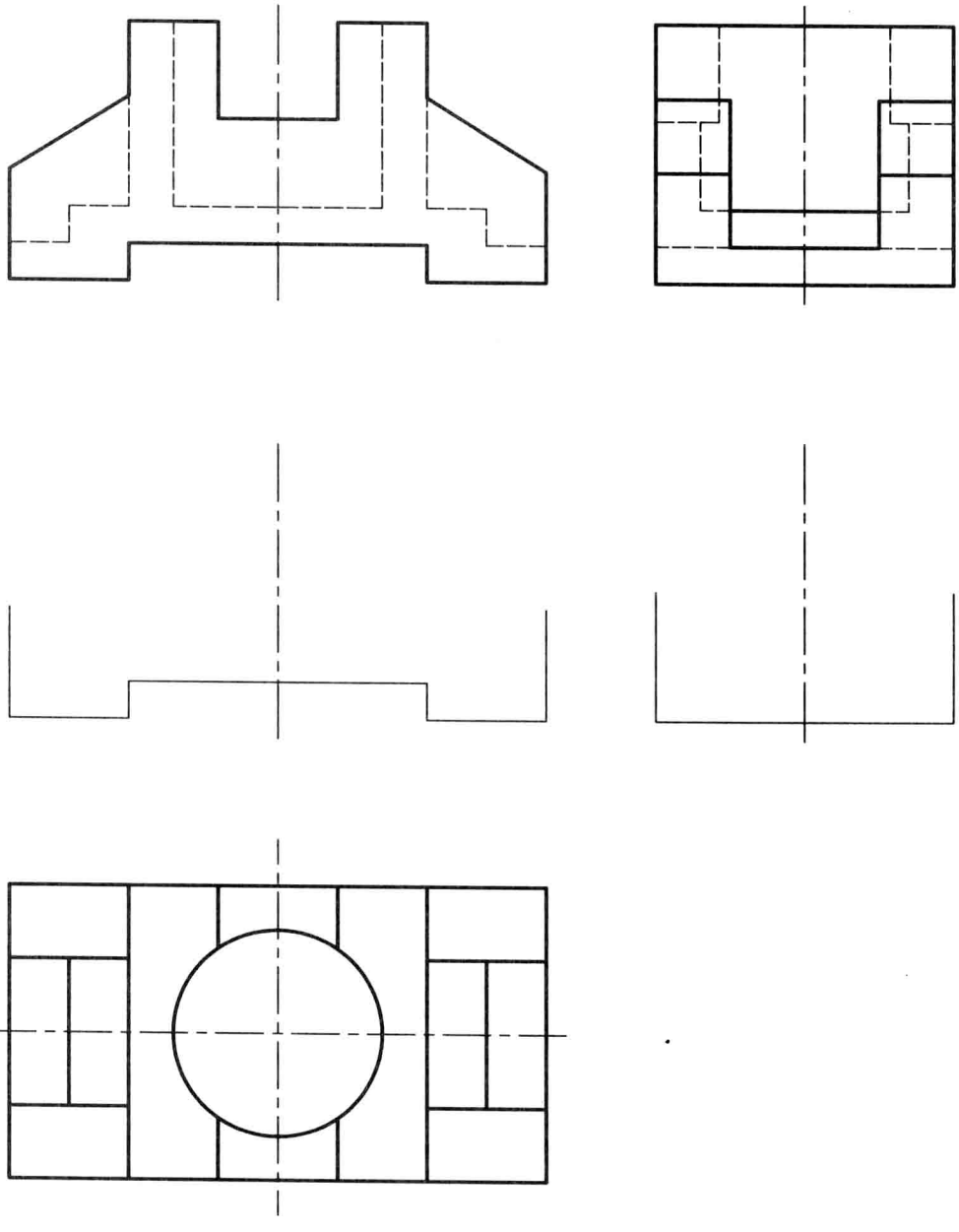


(2)

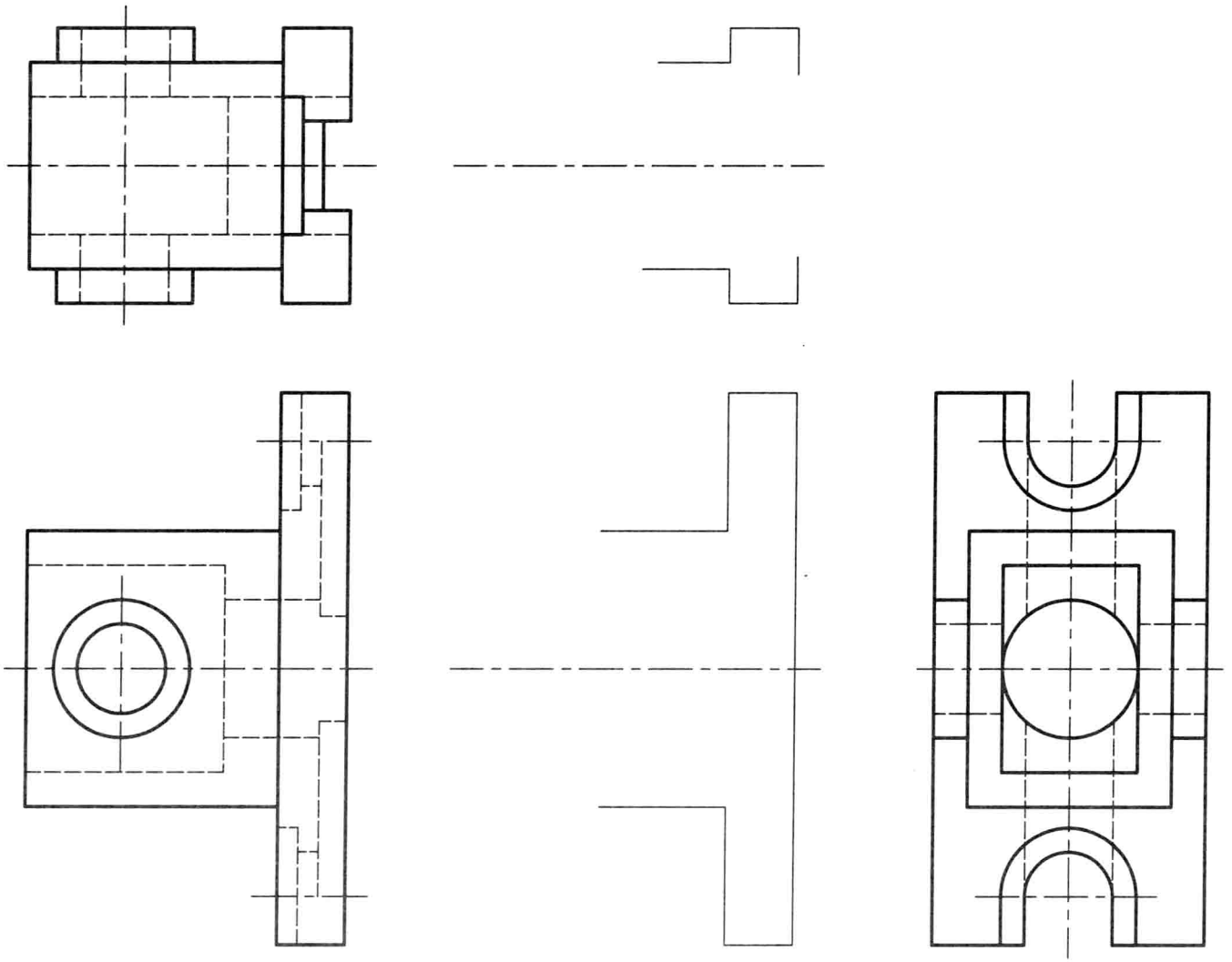


7-5 读懂下列形体，将正立面图、左侧立面图改为半剖面图。

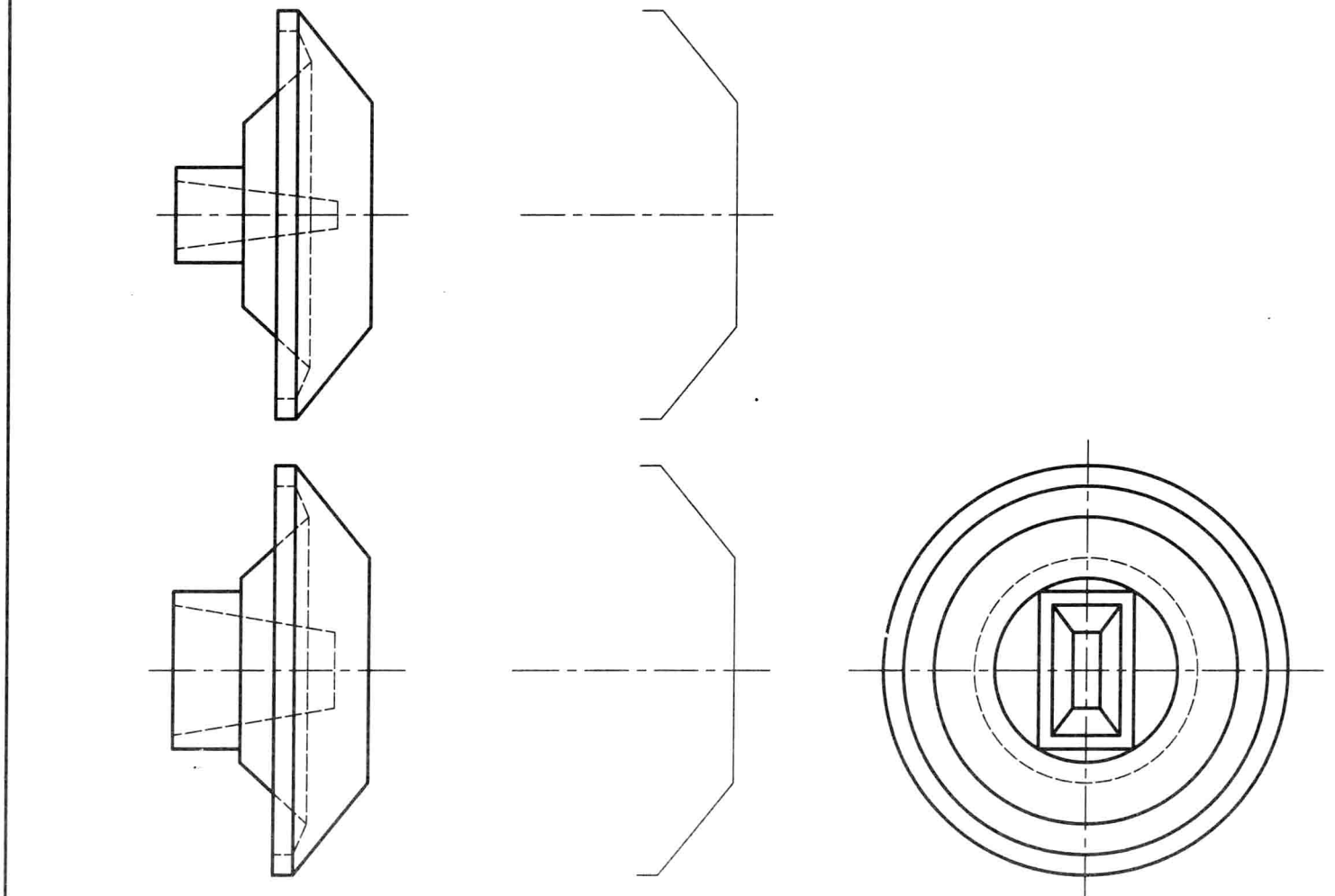
(1)



班级　　姓名



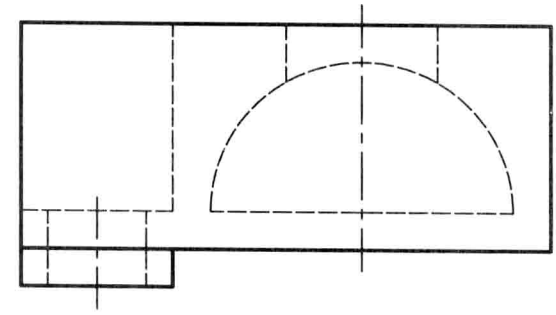
(2)

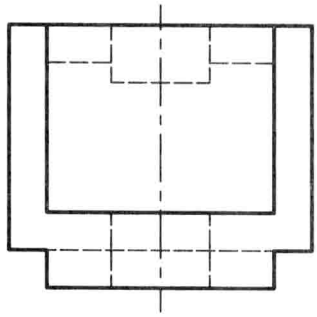


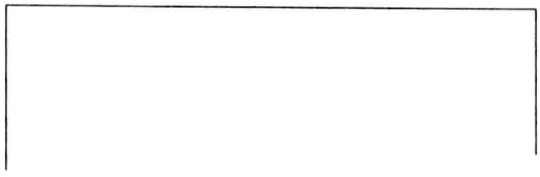
(3)

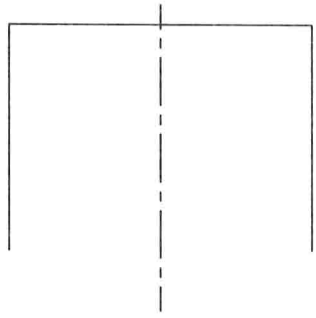
7-6 读懂下列形体，将正立面图、左侧立面图改为适当的剖面图。

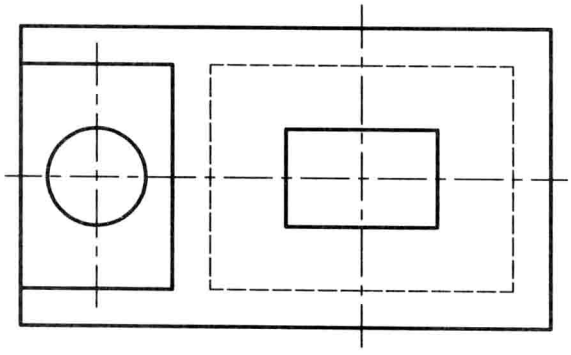
(1)





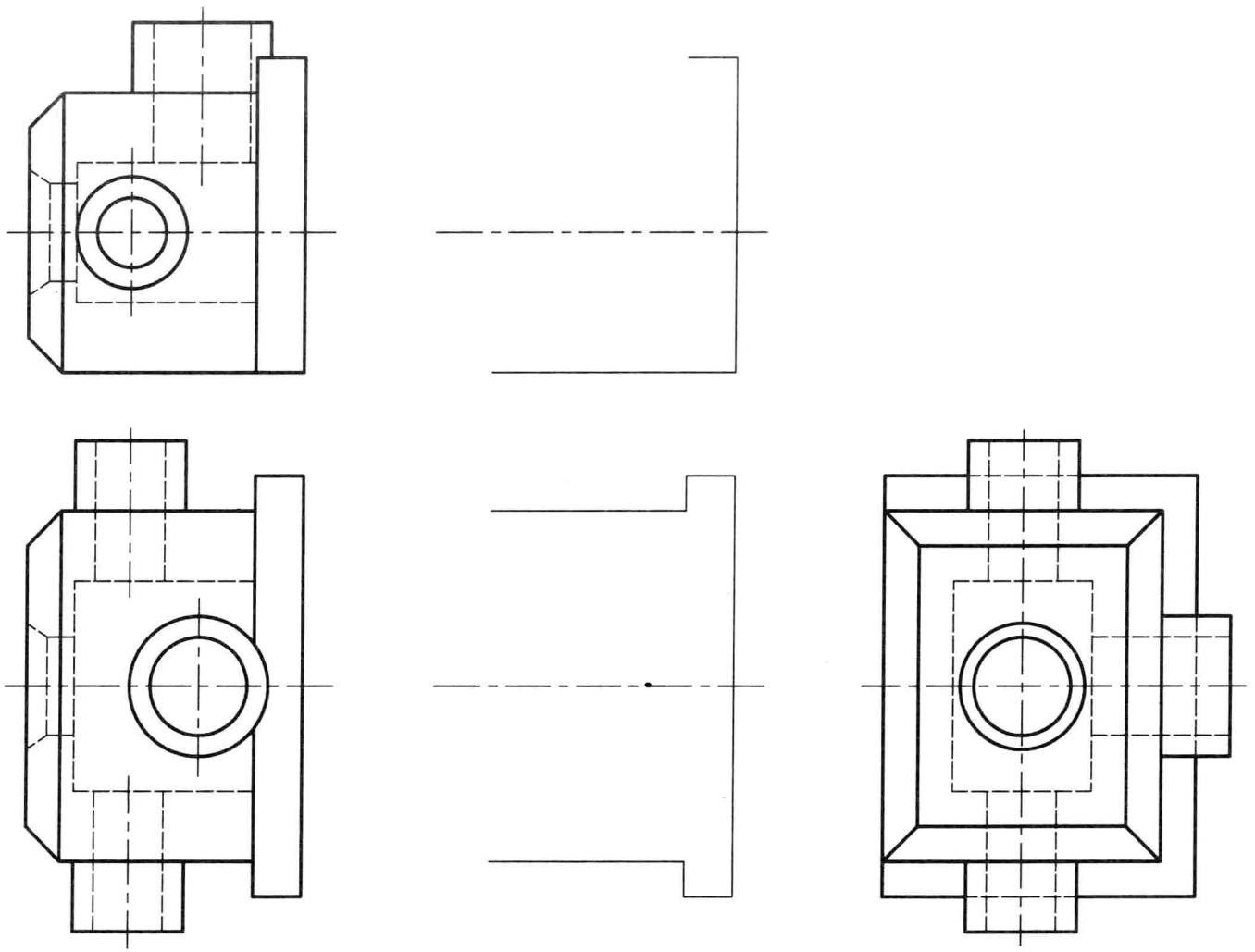






班级

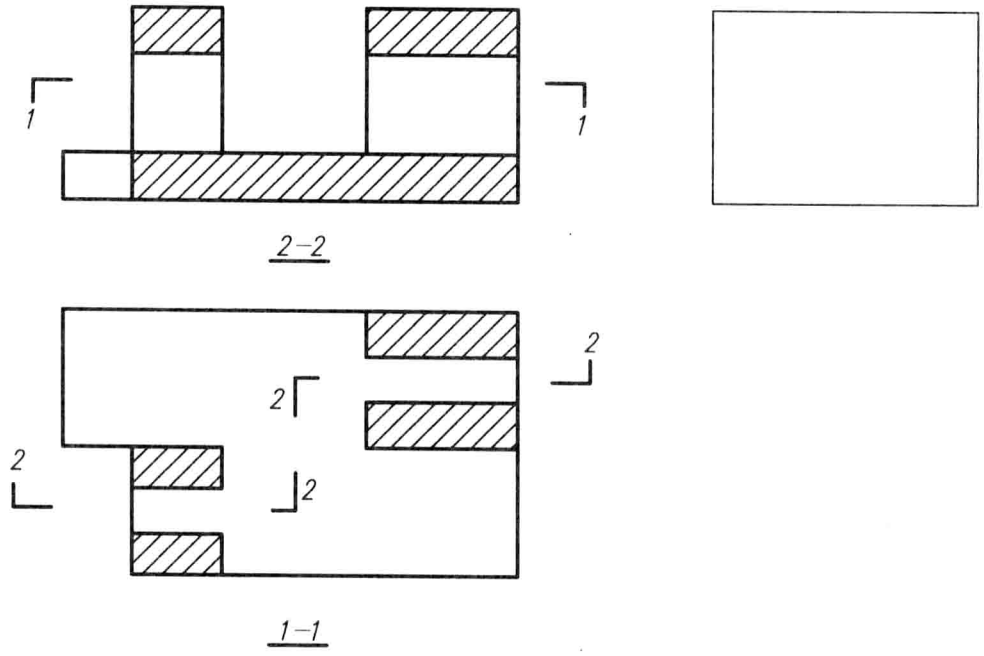
姓名



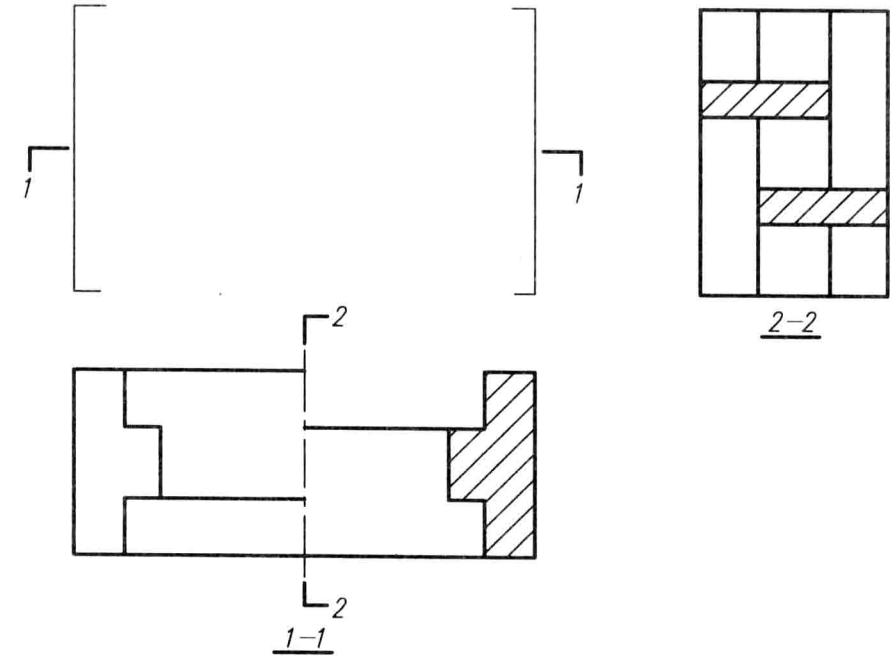
(2)

7-7 已知两投影，求第三投影。

(1) 画出侧立面图。

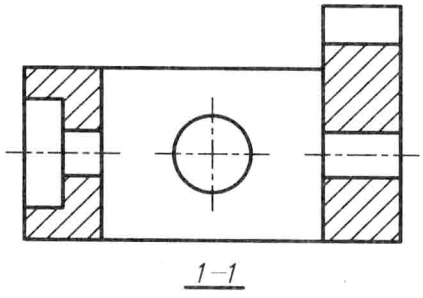


(2) 画出正立面图。

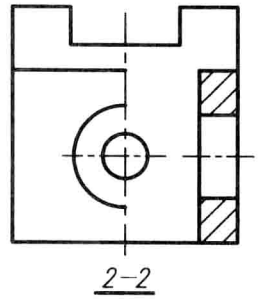


班级　　姓名

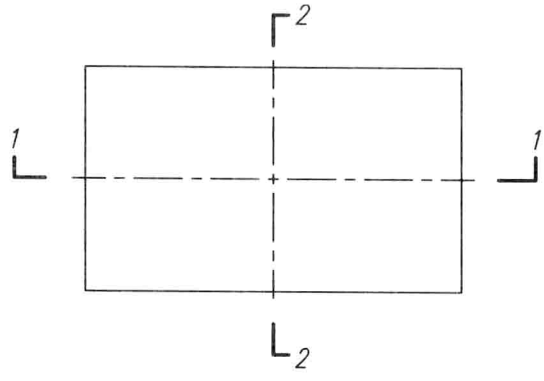
(3) 画出平面图。



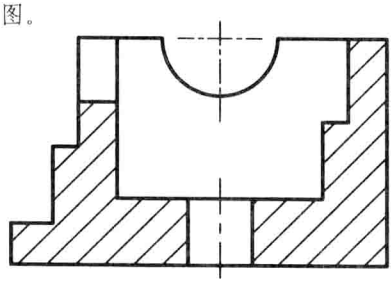
1—1



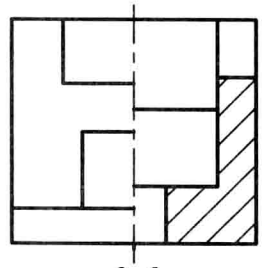
2—2



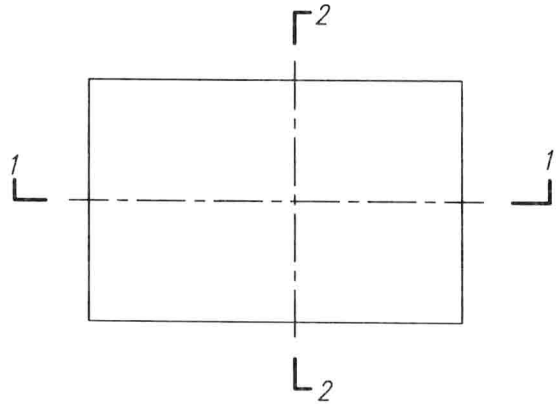
(4) 画出平面图。



1—1



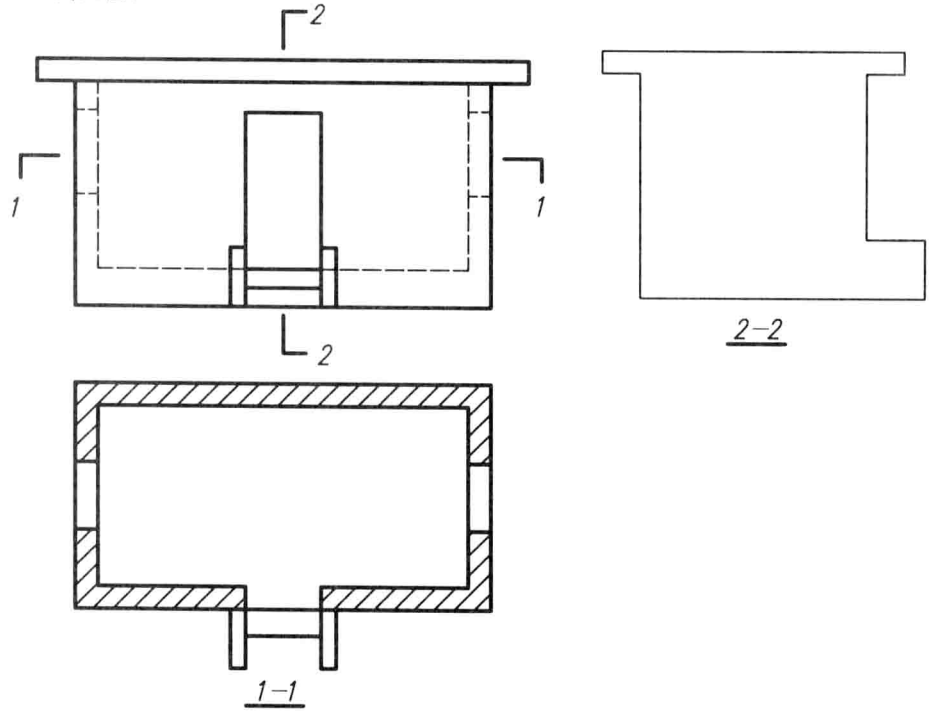
2—2



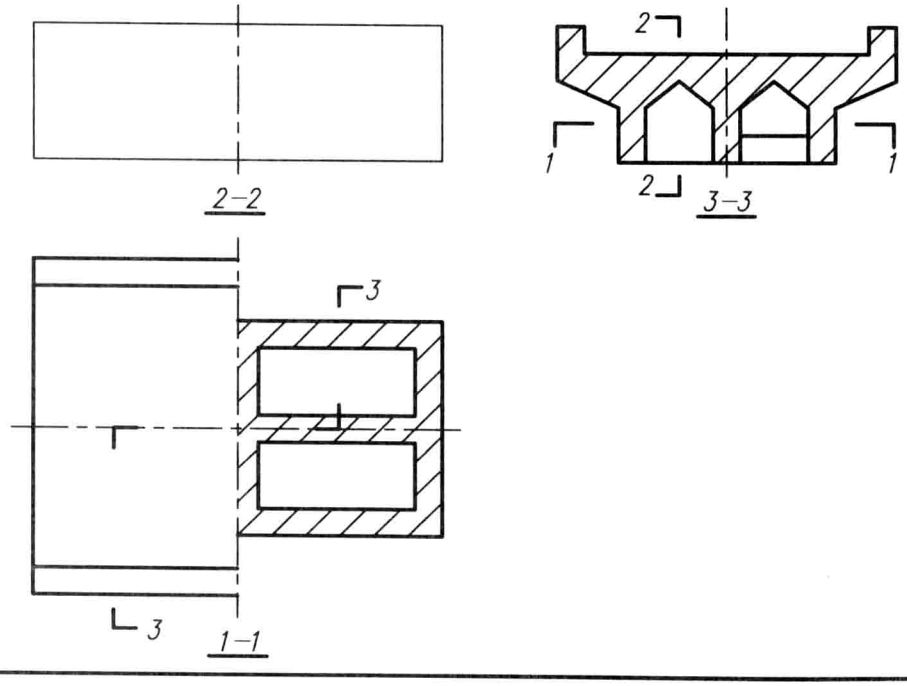
班级

姓名

(5) 画出2—2剖面图。



(6) 画出2—2半剖面图。

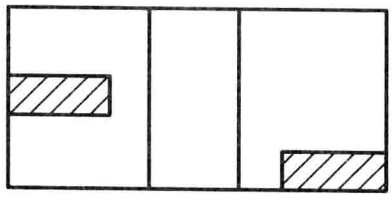


班级

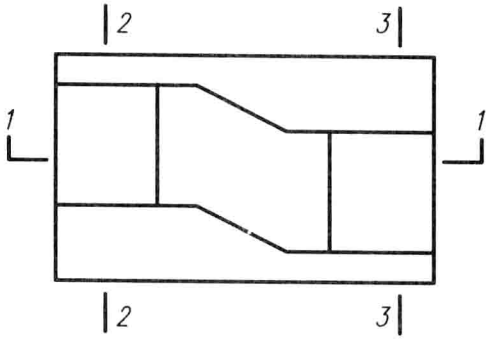
姓名

7-8 在指定位置画出断面图。

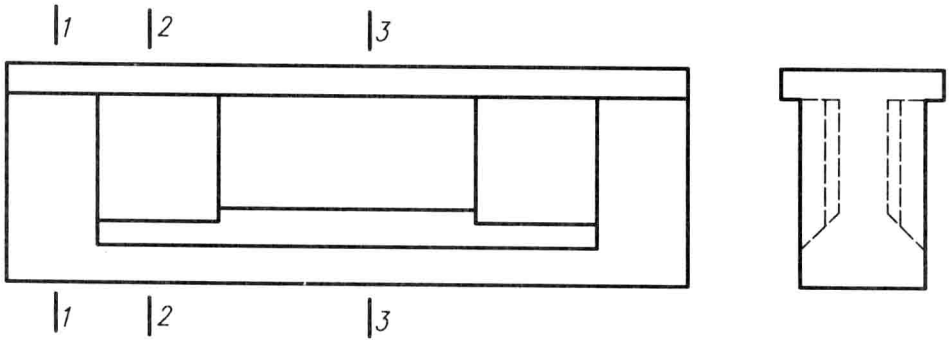
(1)

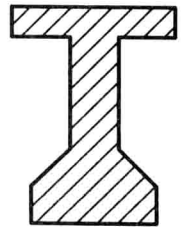


2—2　　1—1　　3—3



(2)



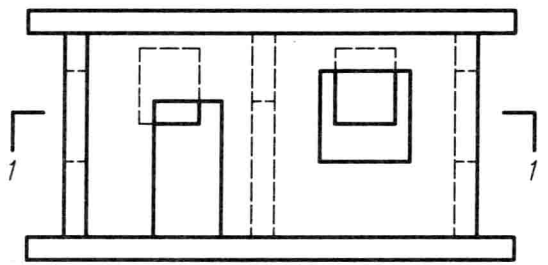


1—1　　2—2　　3—3

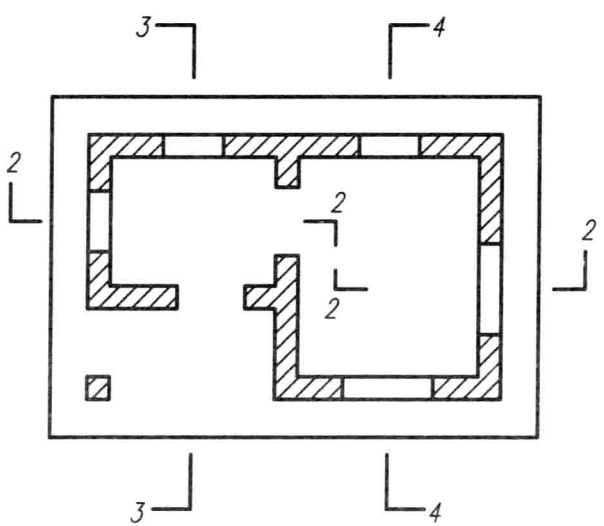
班级　　姓名

7-9 读懂下列形体，画出指定位置的剖面图。

(1)



2—2

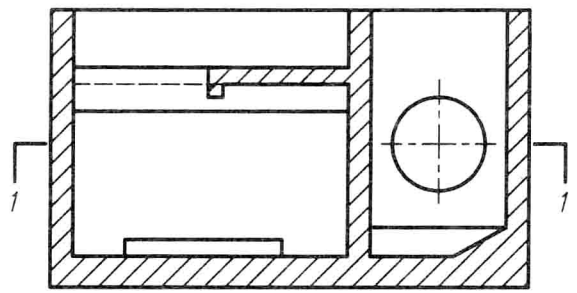


1—1

3—3

4—4

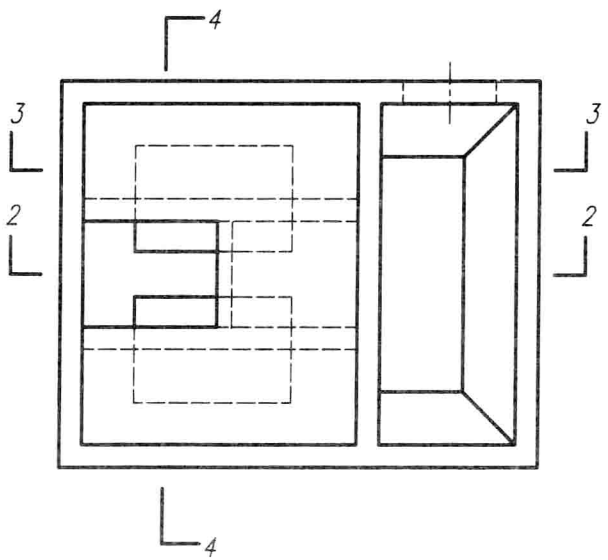
(2)



2—2

3—3

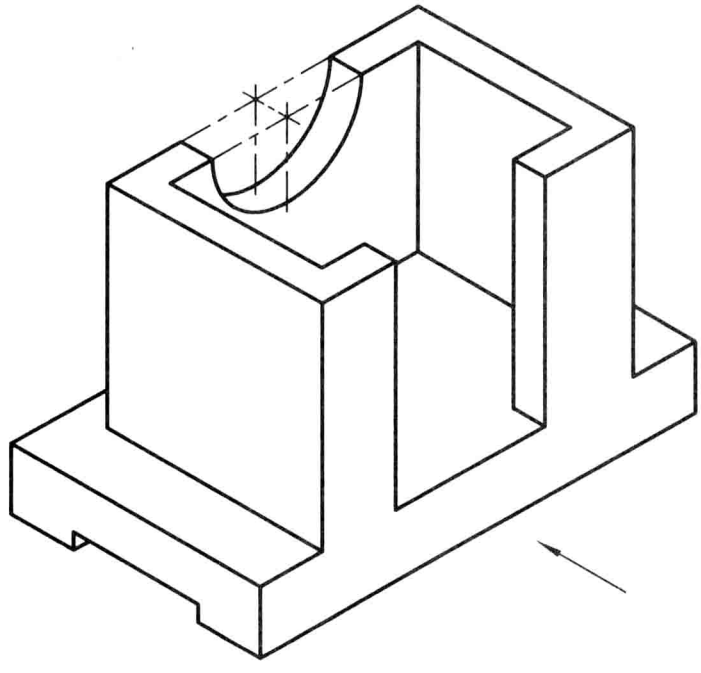
4—4



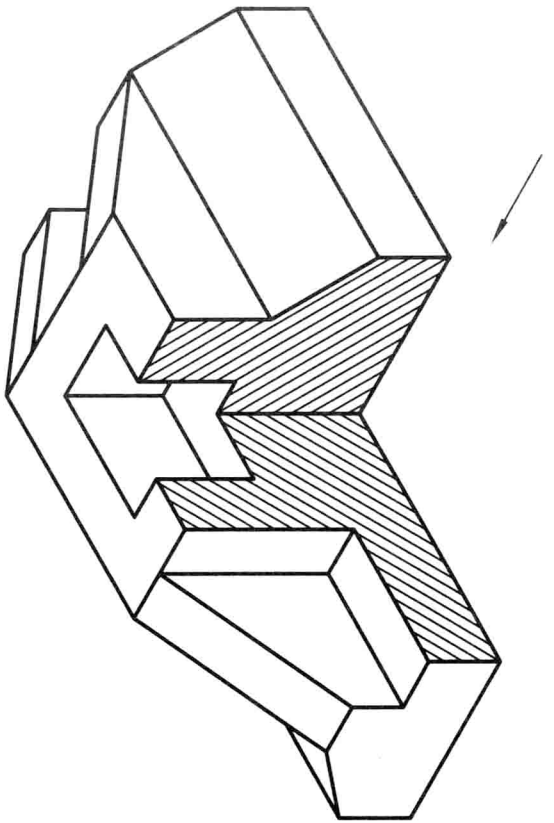
1—1

7-10 根据轴测图画出平面图，并把正立面图、左侧立面图画成适当的剖面图(大小由图中量取)。

(1)



班级　　姓名

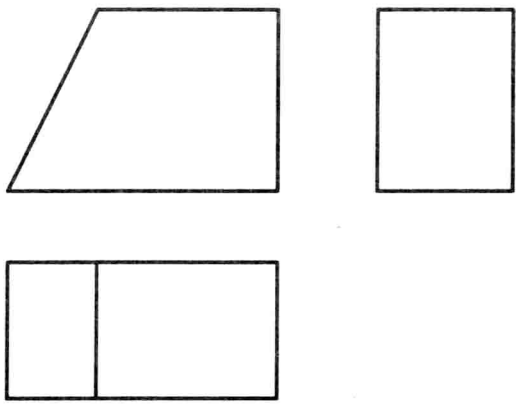


(2)

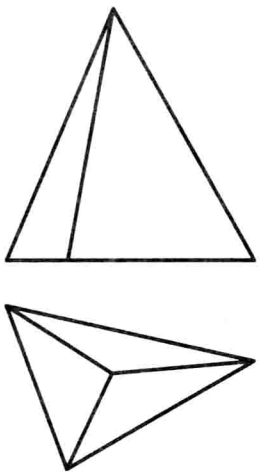
班级　　姓名

8-1 根据投影图，作平面立体的正等轴测图。

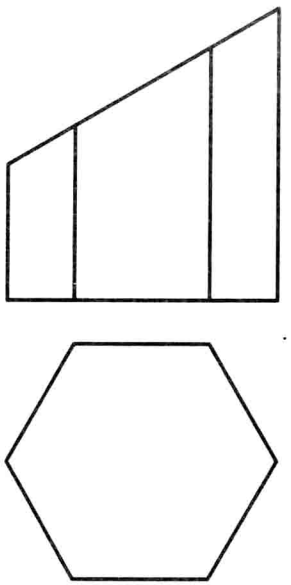
(1)



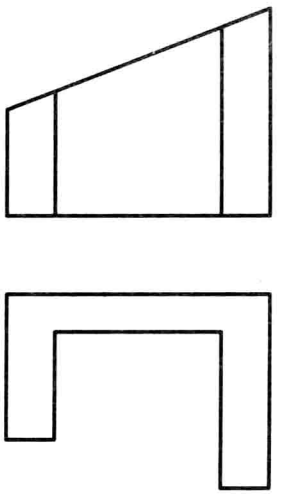
(2)



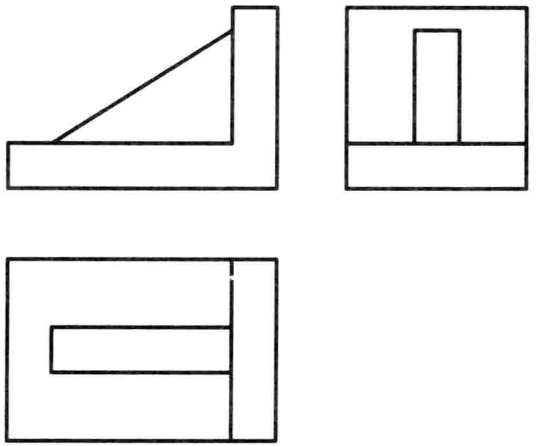
(3)



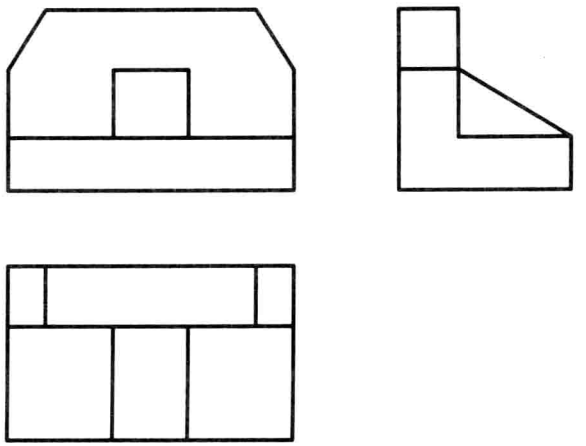
(4)



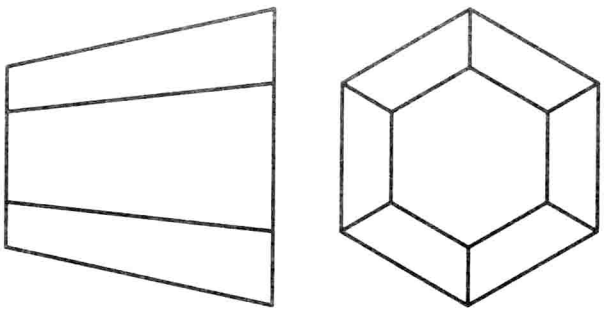
(5)



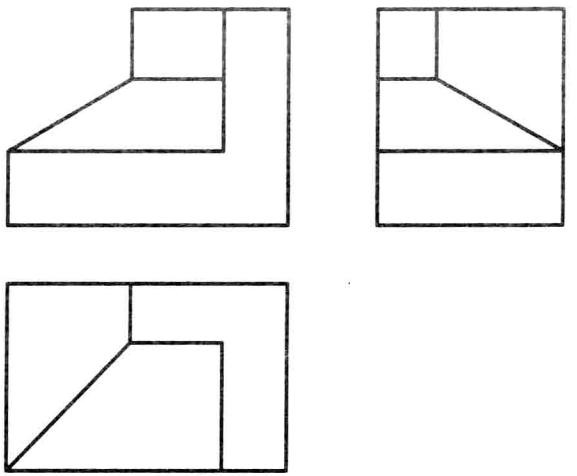
(6)



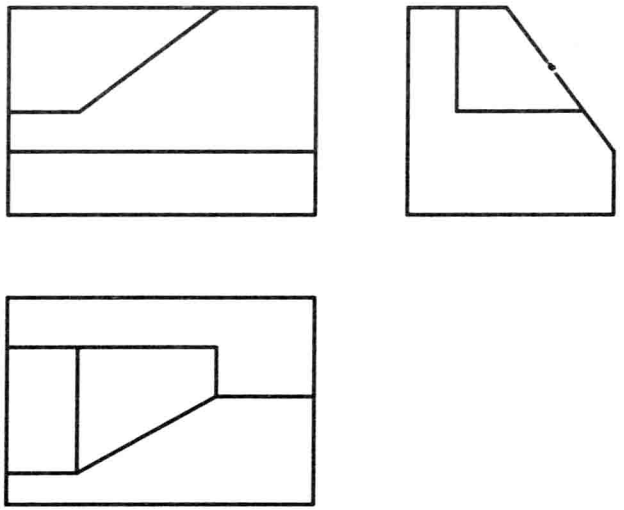
(7)



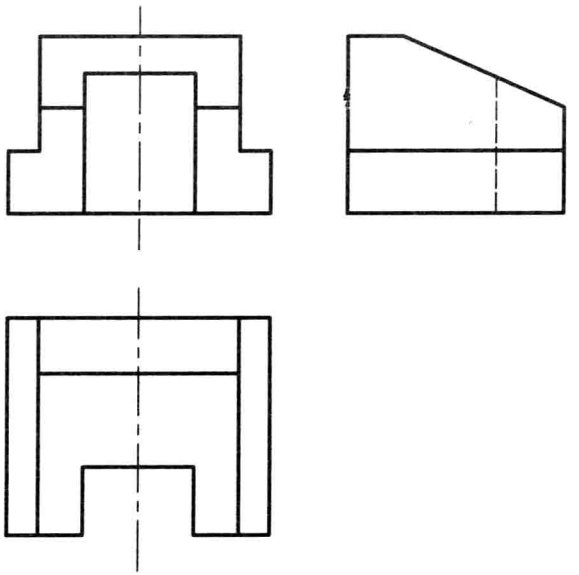
(8)



(9)

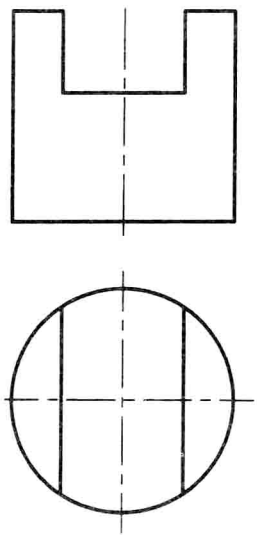


(10)

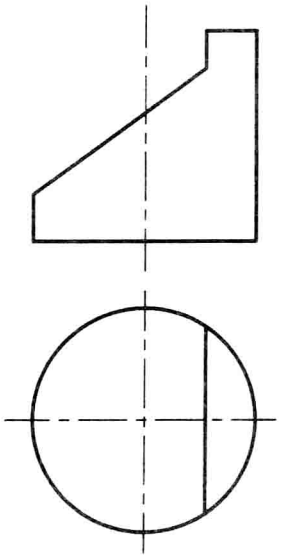


8-2 根据投影图，作曲面立体的正等轴测图。

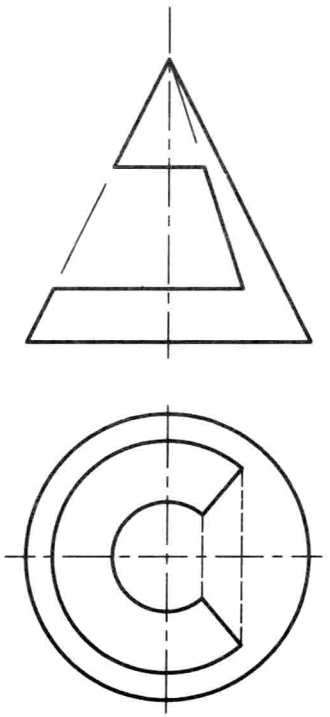
(1)



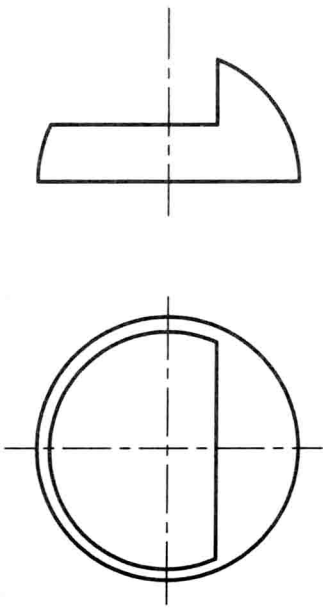
(2)



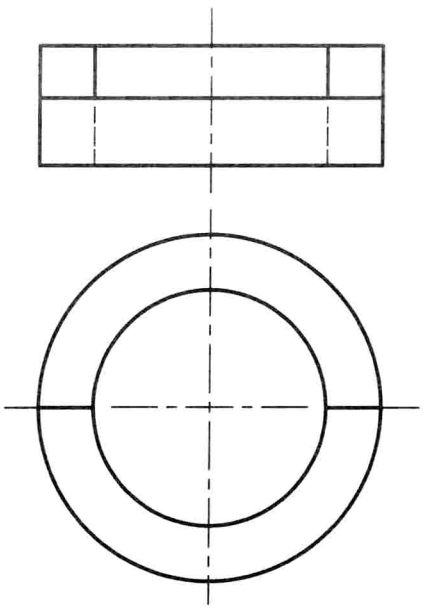
(3)



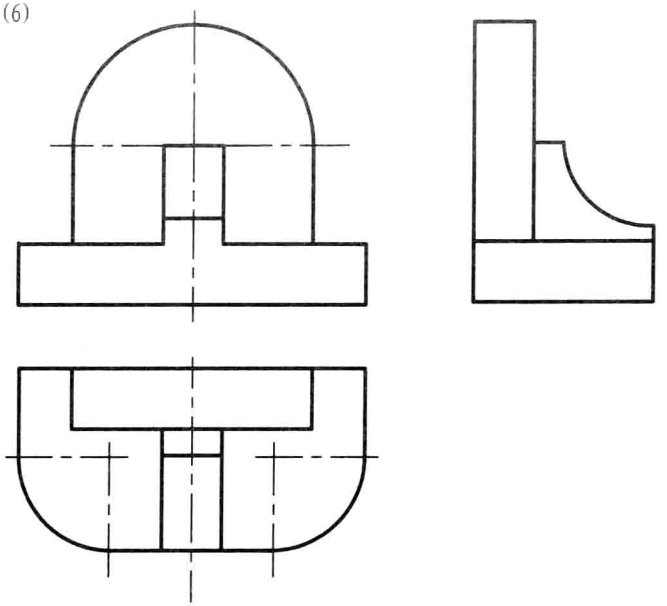
(4)



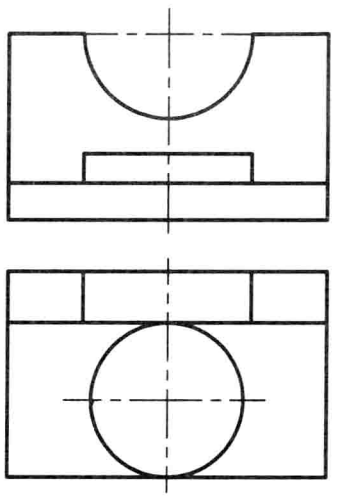
(5)



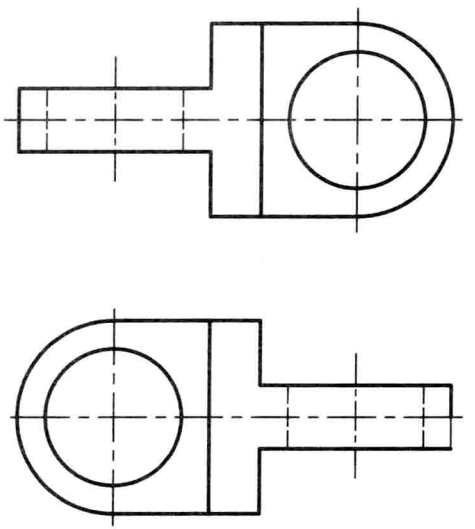
(6)



(7)

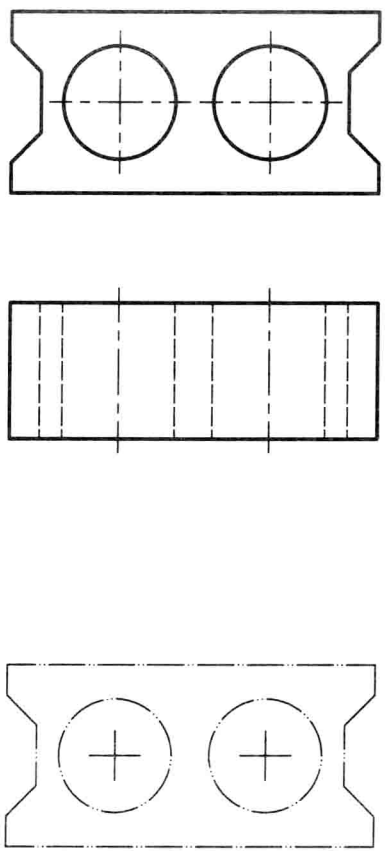


(8)

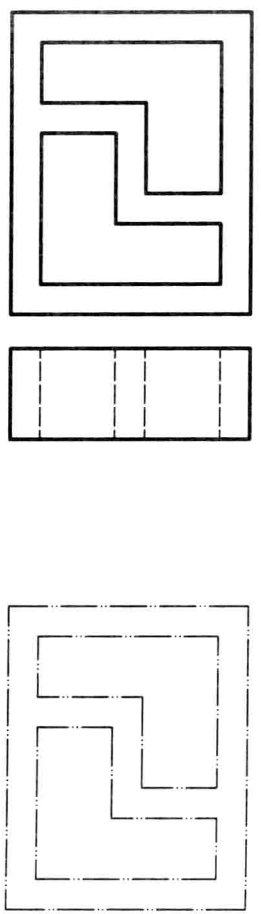


8-3 根据投影图，作形体的正面斜二轴测图。

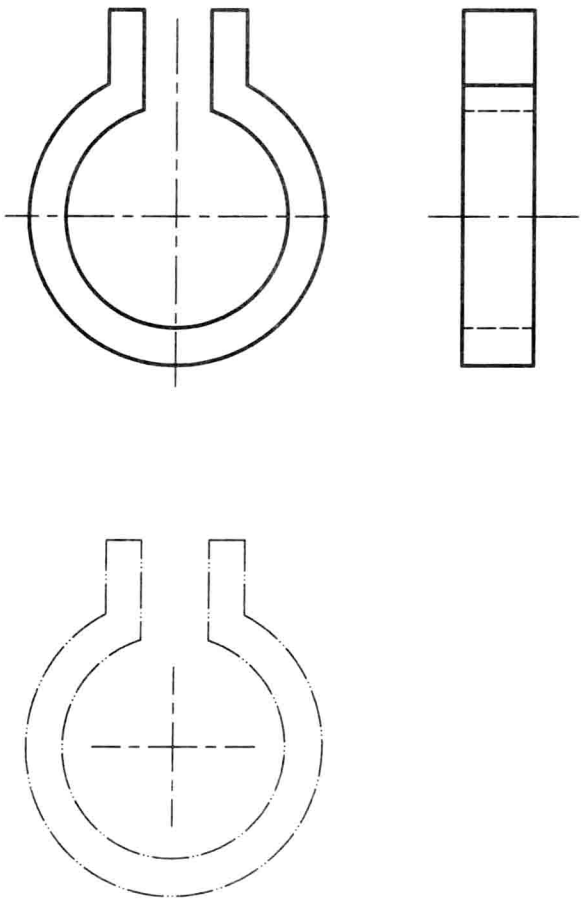
(1)



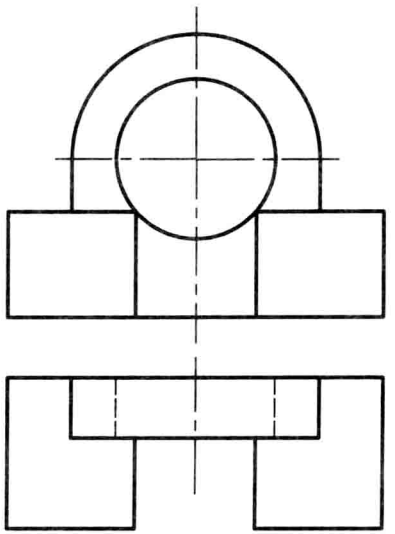
(2)



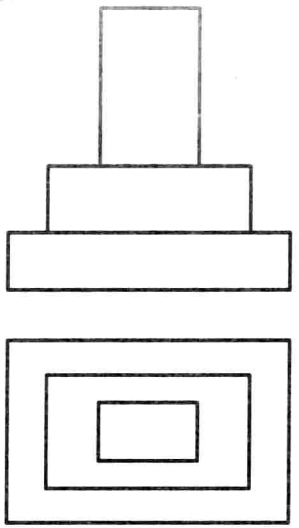
(3)



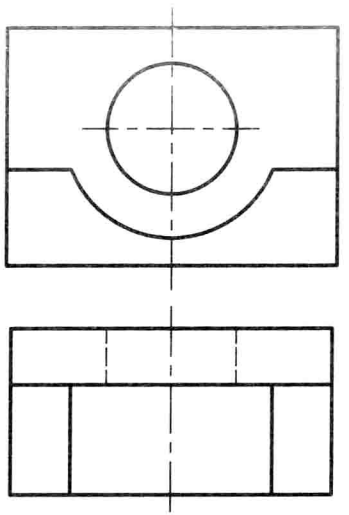
(4)



(5)

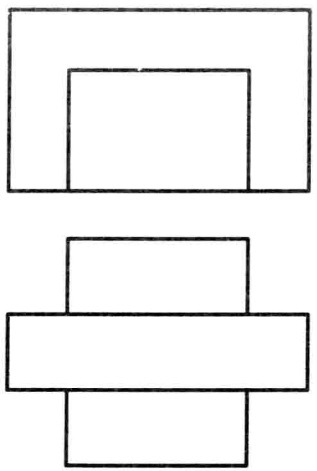


(6)

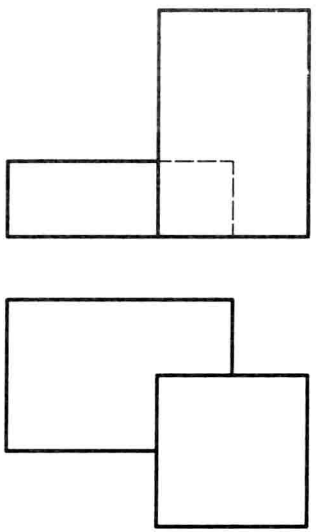


8-4 根据投影图，作形体的水平斜等轴测图。

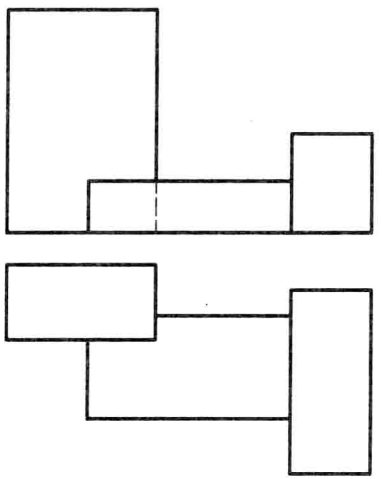
(1)

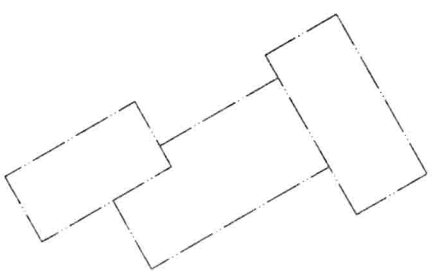


(2)

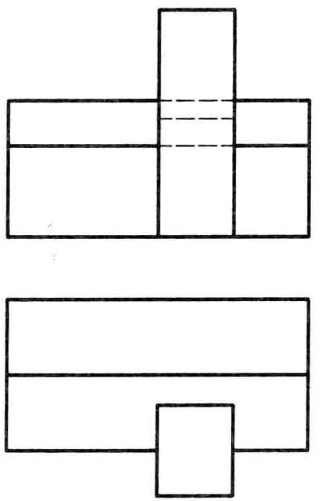


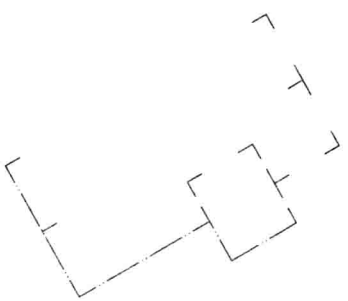
(3)



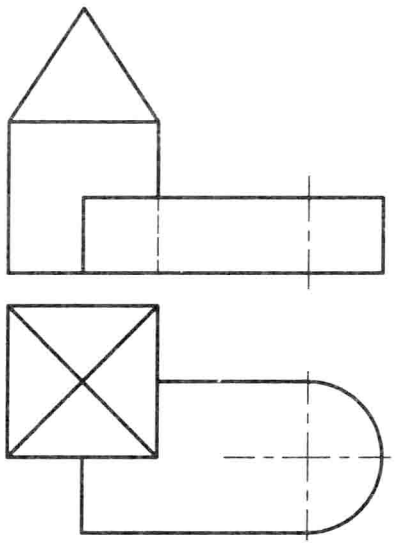


(4)

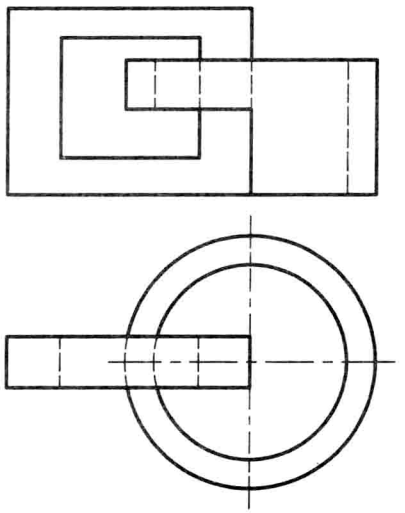


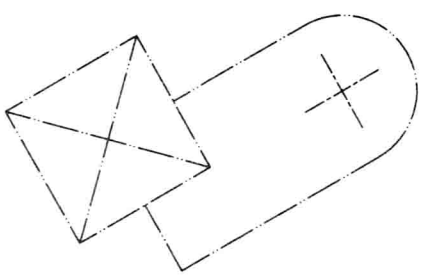


(5)



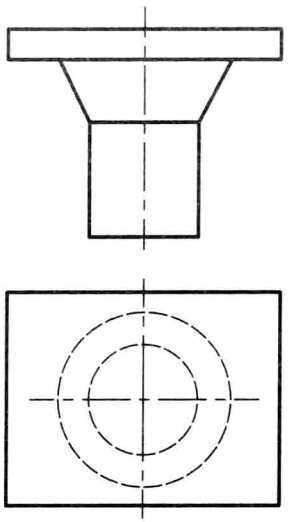
(6)



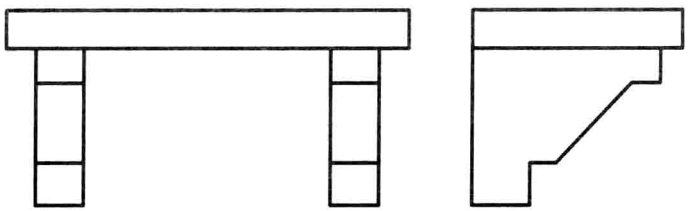


8-5 根据投影图，作形体的仰视正等轴测图。

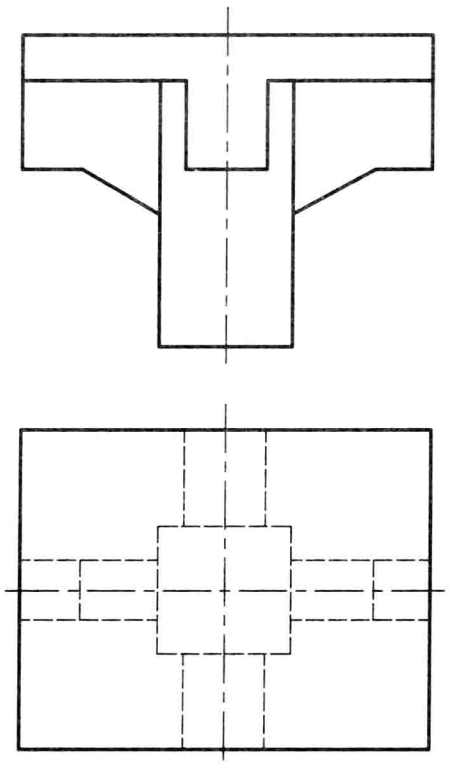
(1)



(2)

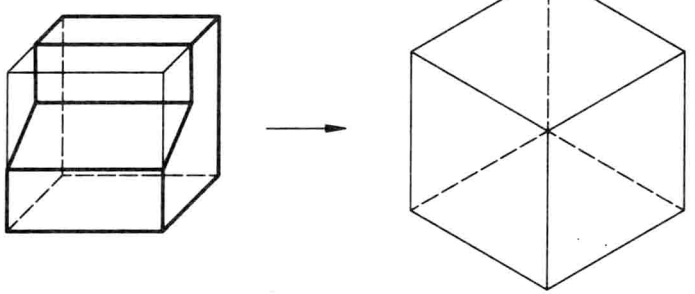


(3)

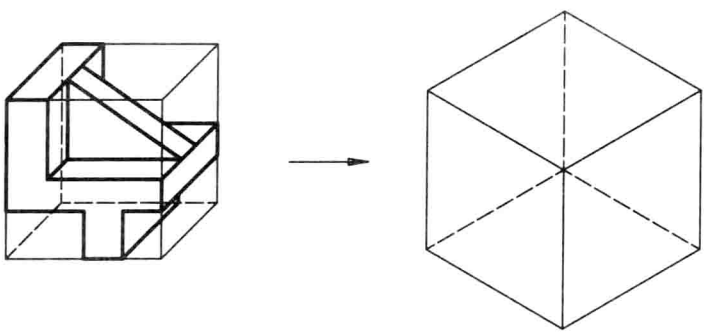


8-6 根据斜二轴测图绘制正等轴测图。

(1)

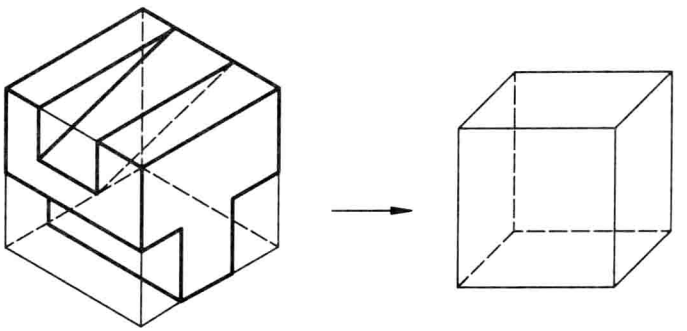


(2)

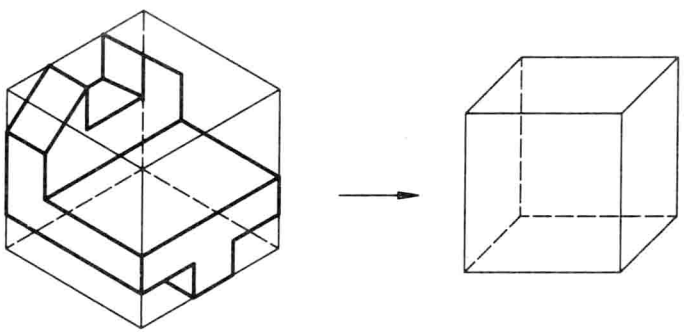


8-7 根据正等轴测图绘制斜二轴测图。

(1)

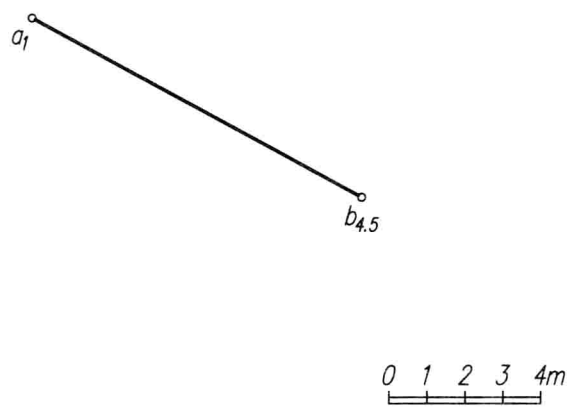


(2)

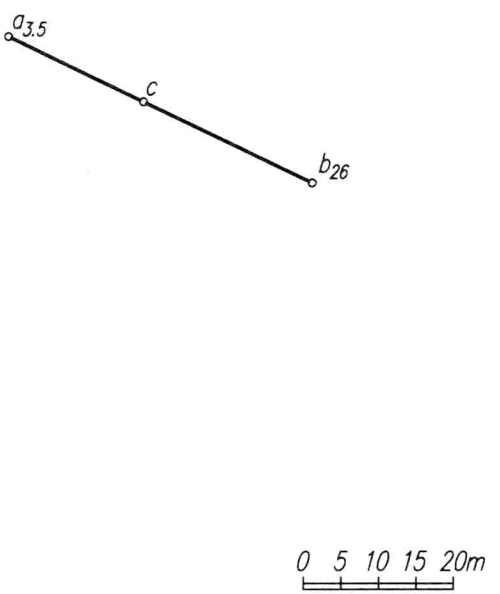


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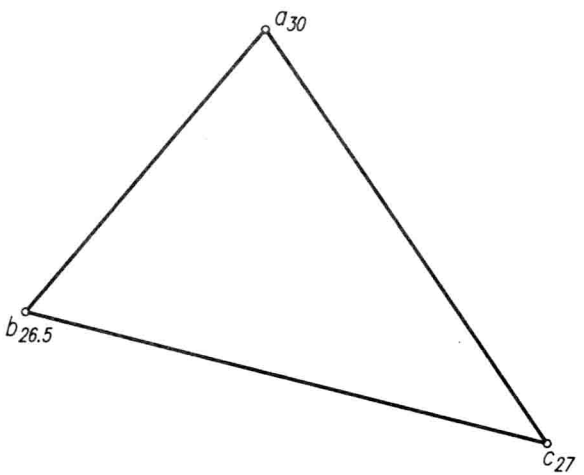
9-1 已知*AB*直线的标高投影，求*AB*直线坡度*i*及整数标高点。



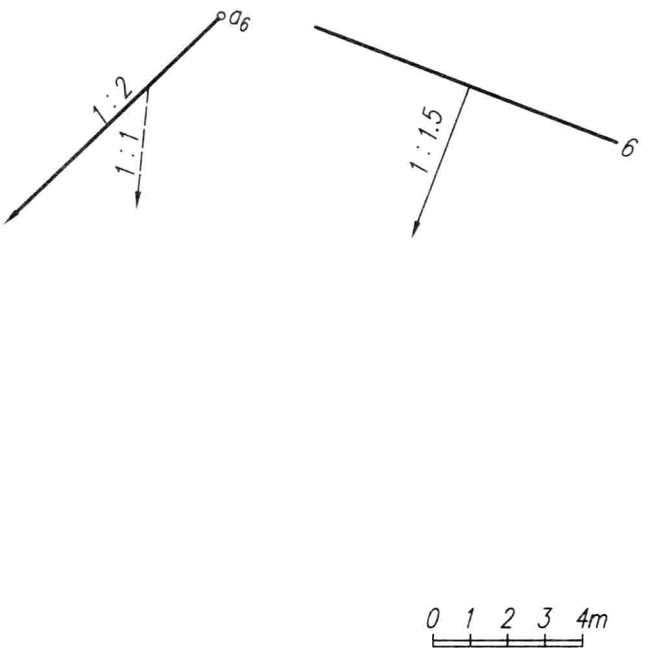
9-2 已知*AB*直线的标高投影，求*C*点的标高。



9-3 已知平面的标高投影为$a_{30}b_{26.5}c_{27}$，求平面上的等高线及平面对*H*面的倾角α。

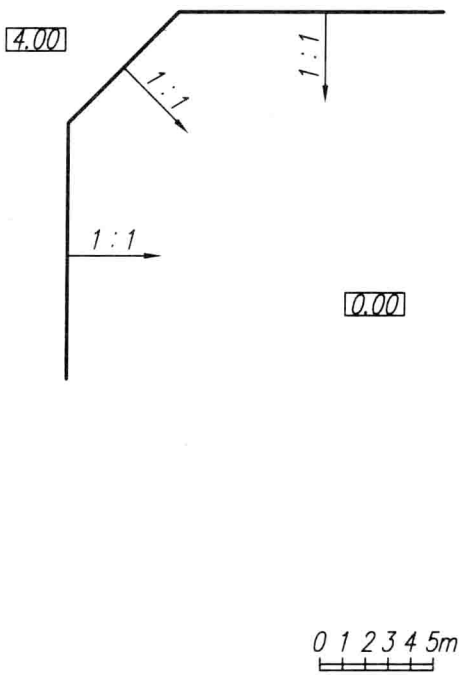


9-4 求两平面的交线。

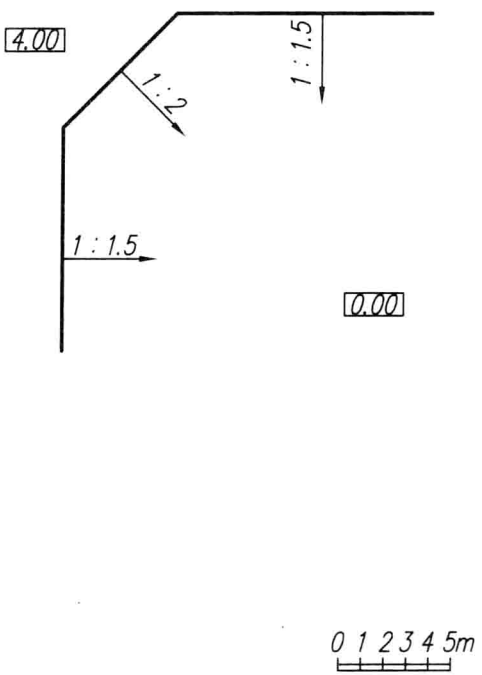


9-5 在高程为0的地面上修筑一平台，平台高程为4.00 m，图为平台一角，求坡面交线及坡脚线。

(1)

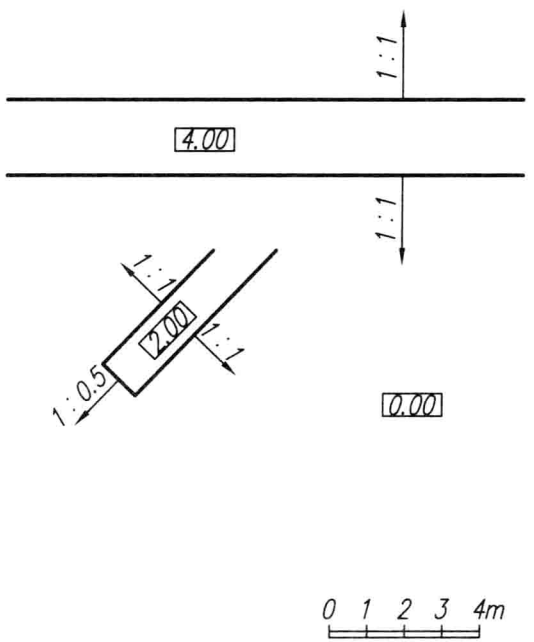


(2)

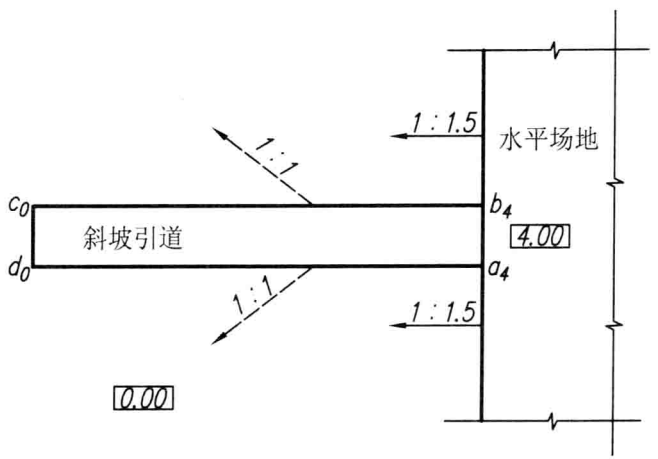


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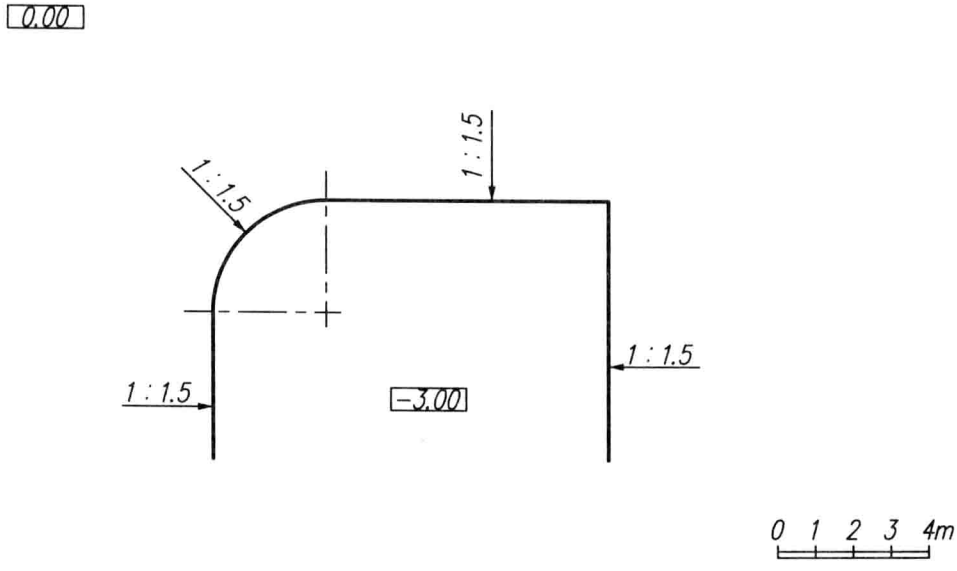
9-6 两堤高程及各坡面坡度如图所示，求坡面交线及坡脚线。



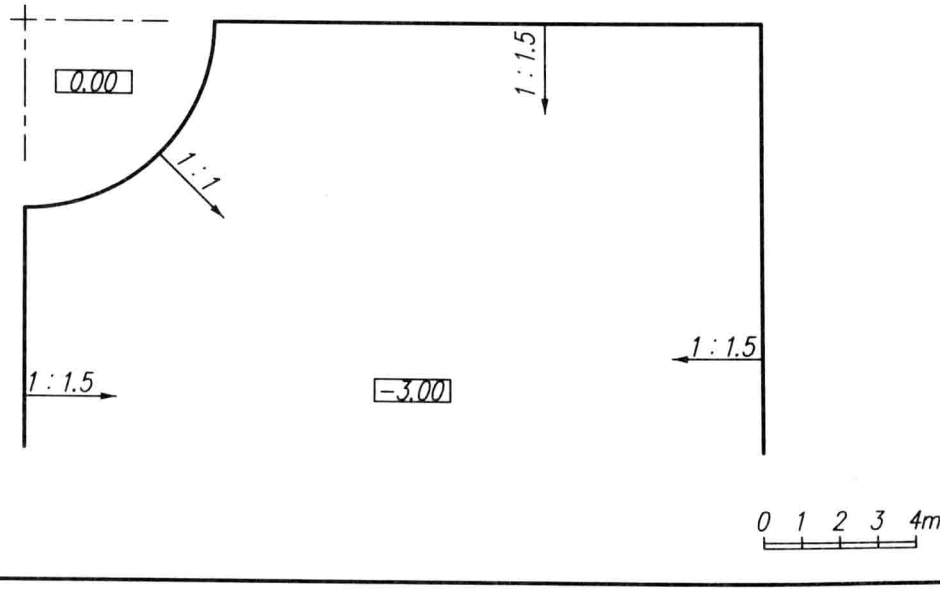
9-7 求水平场地和斜坡引道两侧的坡脚线及其坡面间交线。



9-8 在高程为0的地面上挖一基坑，基底高程为-3.00 m，图为基坑底部一部分，求作基坑开挖线及各坡面间交线。



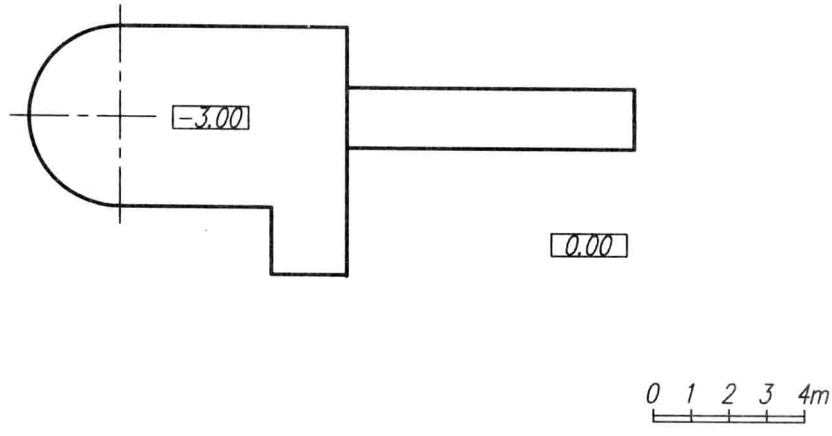
9-9 在高程为0的地面上挖一基坑，基底高程为-3.00 m，图为基坑部分开挖线，求作基坑各坡面间交线及与基底交线。



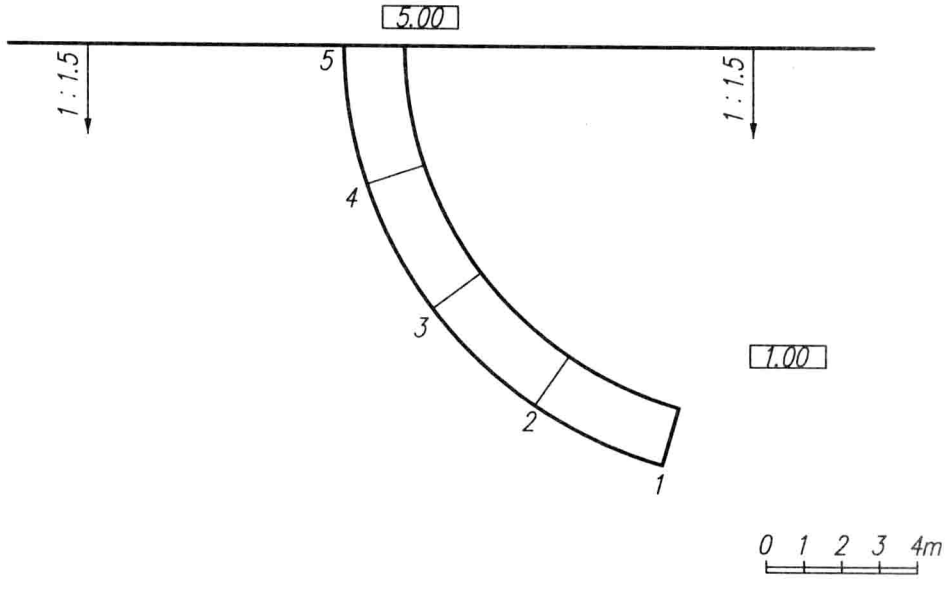
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9-10 在高程为0的地面上挖一基坑，基底高程为-3.00 m，右侧为一斜引道，基坑四周及斜引道两侧的挖方坡度为1∶1，求作开挖线及各坡面间交线。



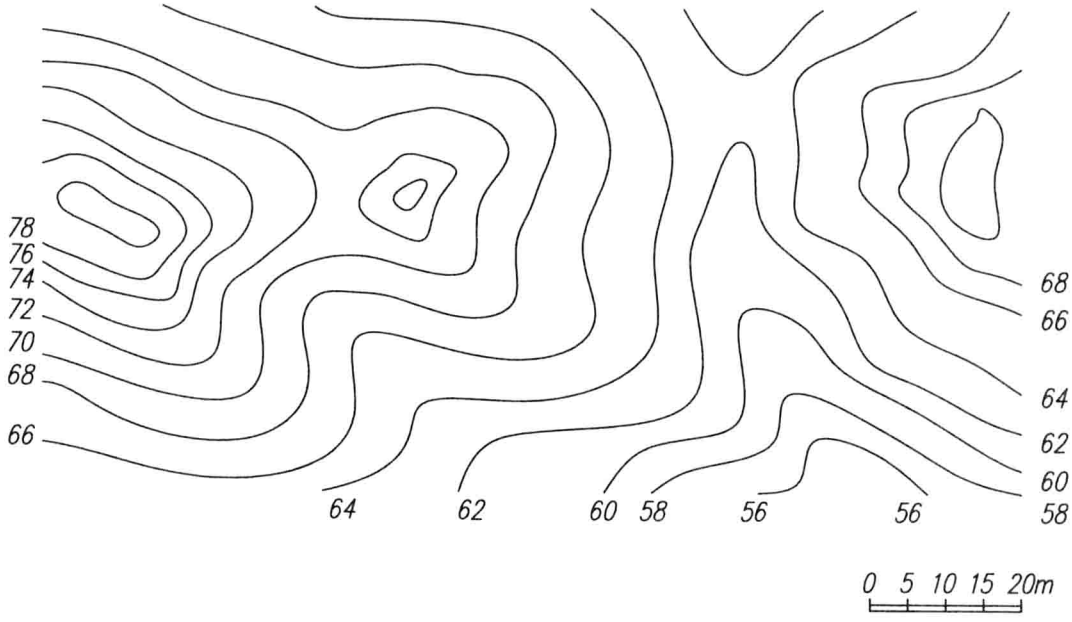
9-11 一弯曲引道将地面(高程为1.00 m)与高程为5.00 m的水平场地相连，水平场地及弯曲引道边坡坡度均为1∶1.5，求坡脚线及坡面交线。



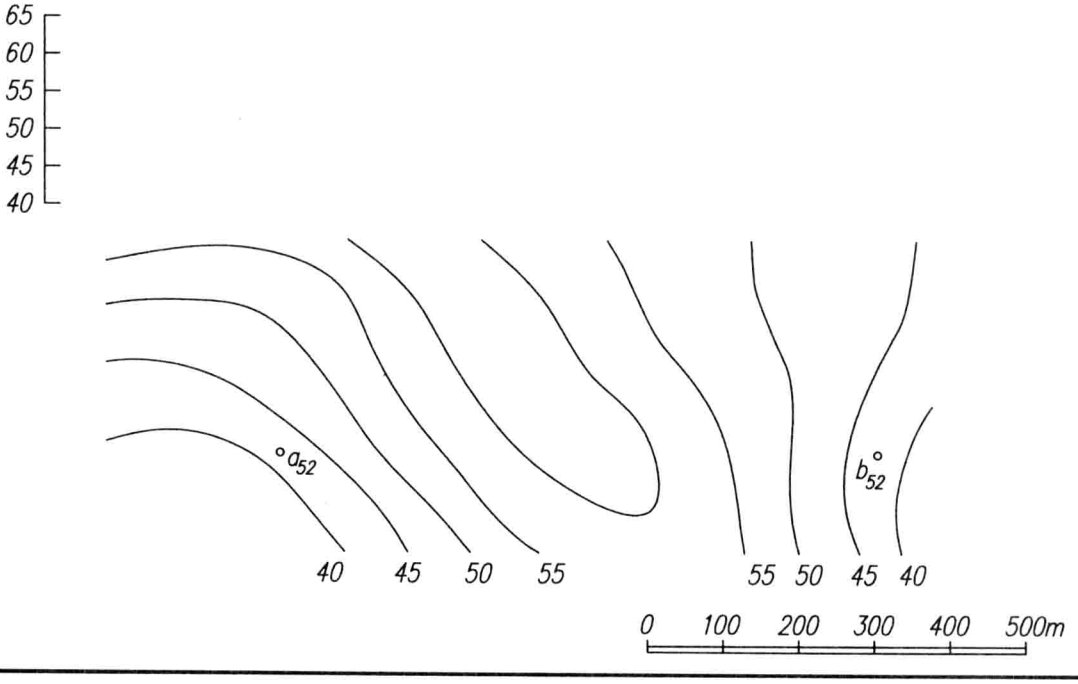
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9-12 在地形图上标出山峰、山脊、山谷和鞍地。



9-13 已知高程为52 m水平管道*AB*的平面位置，求作管道与地面交点，并用虚线表示管道埋入地下部分。

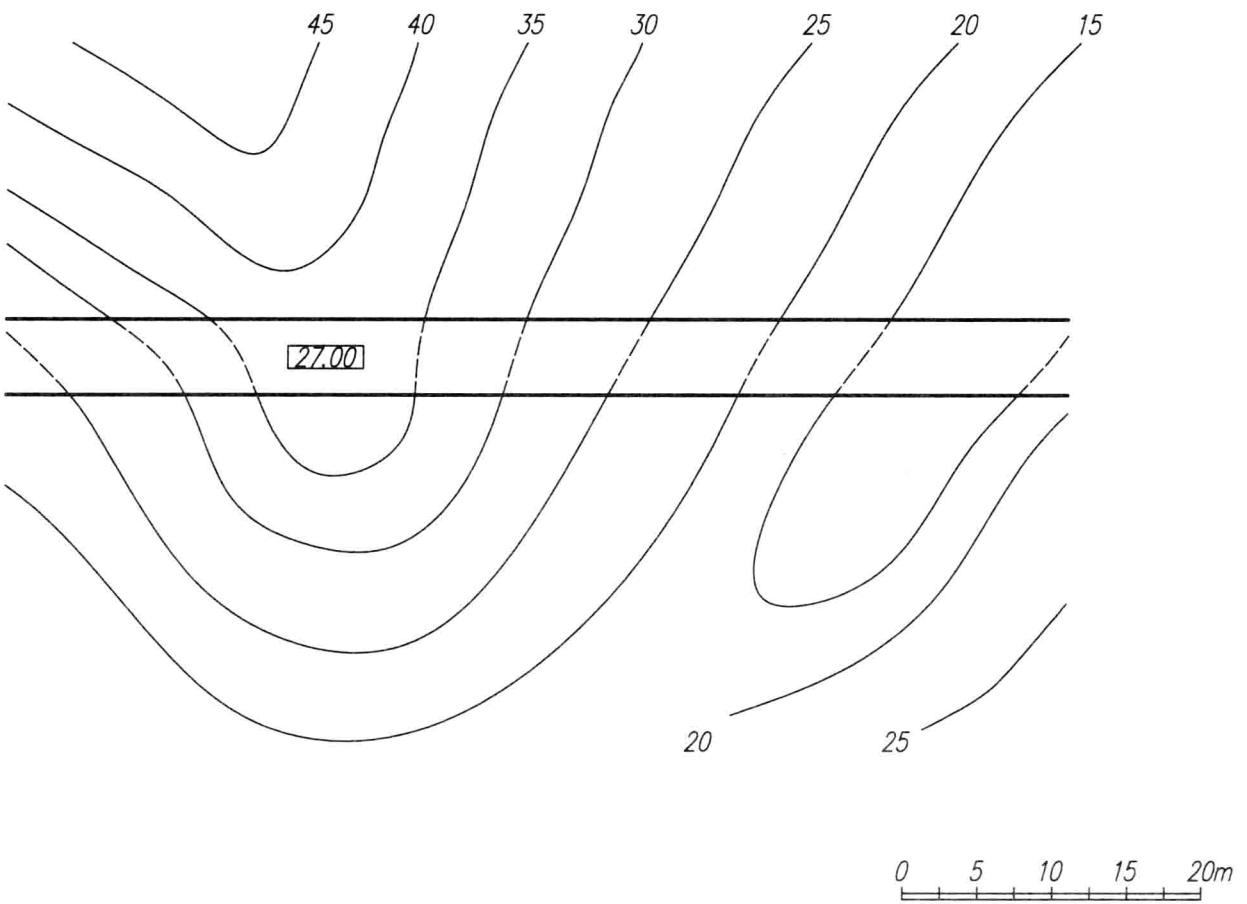


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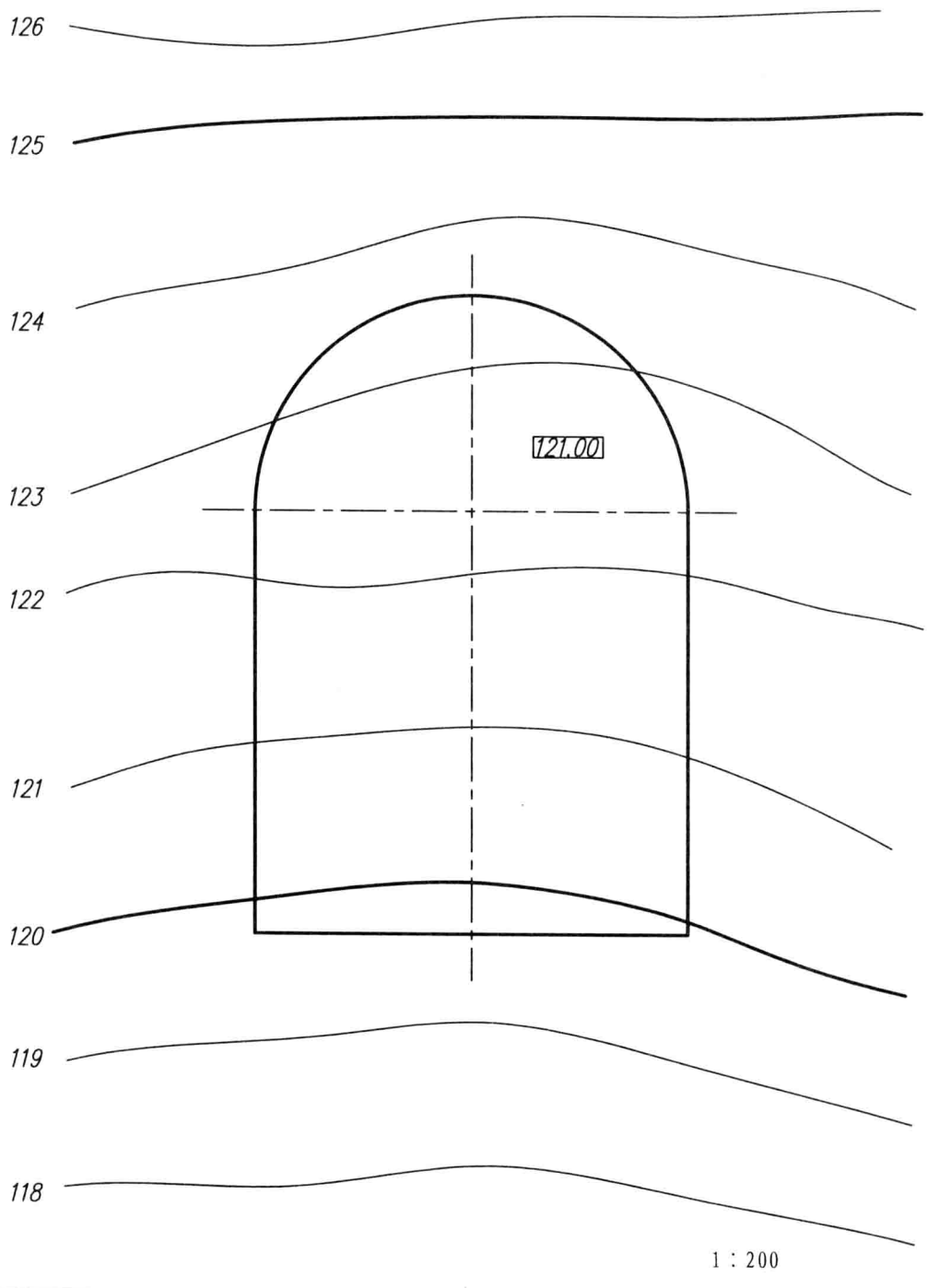
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9-14 已知道路路面位置及高程，道路两侧坡面的填挖方坡度分别为填方 i=1∶1，挖方 i=1∶0.5，求作填挖边界线。



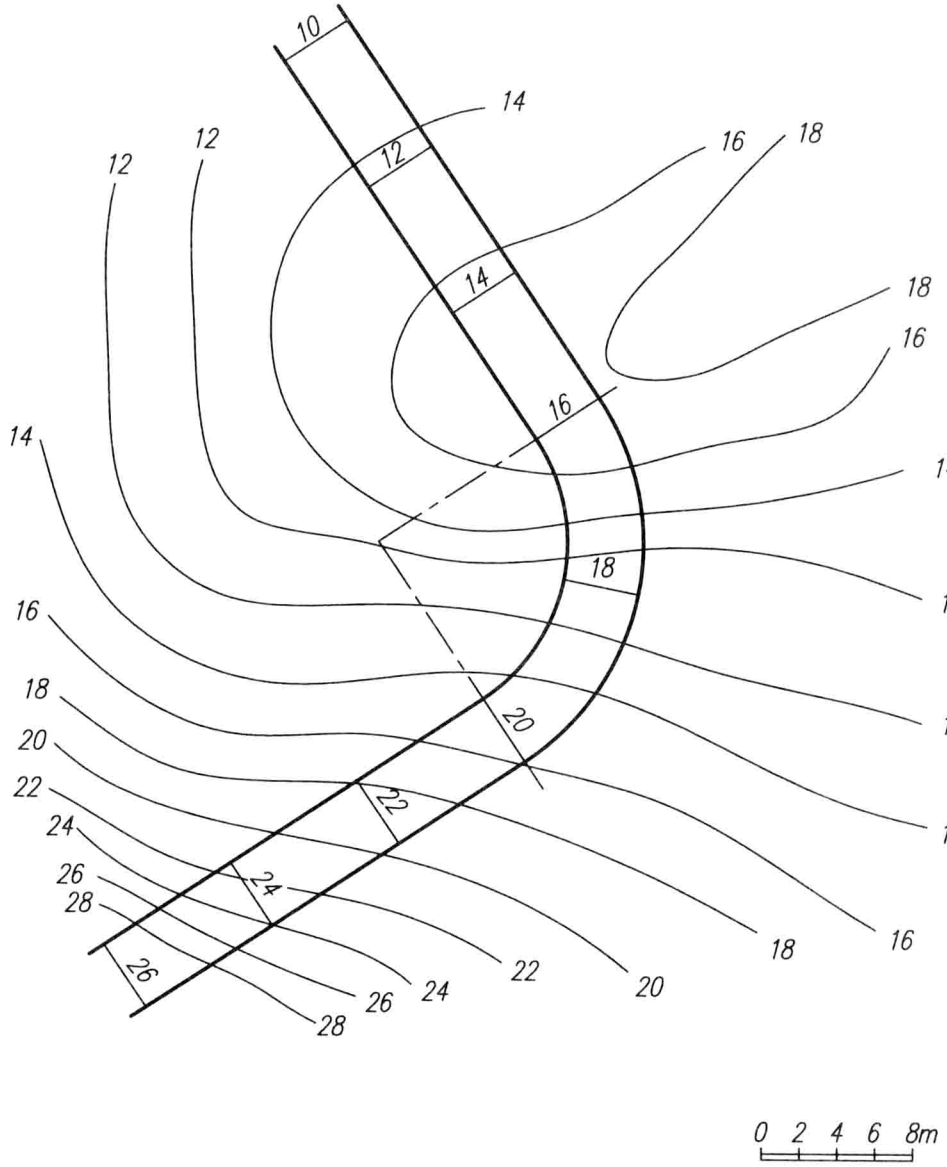
9-15 在山坡上修筑一水平场地，其高程为121 m，已知挖方坡度为1∶1，填方坡度为1∶1.5，求作开挖线、坡脚线和坡面交线。(比例1∶200)



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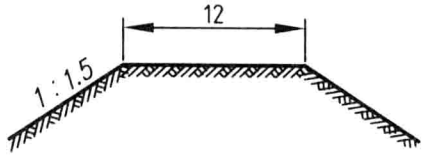
9-16 已知填方和挖方的坡度均为1：1，求作道路两侧坡面与地面的交线。

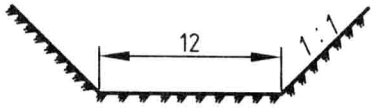


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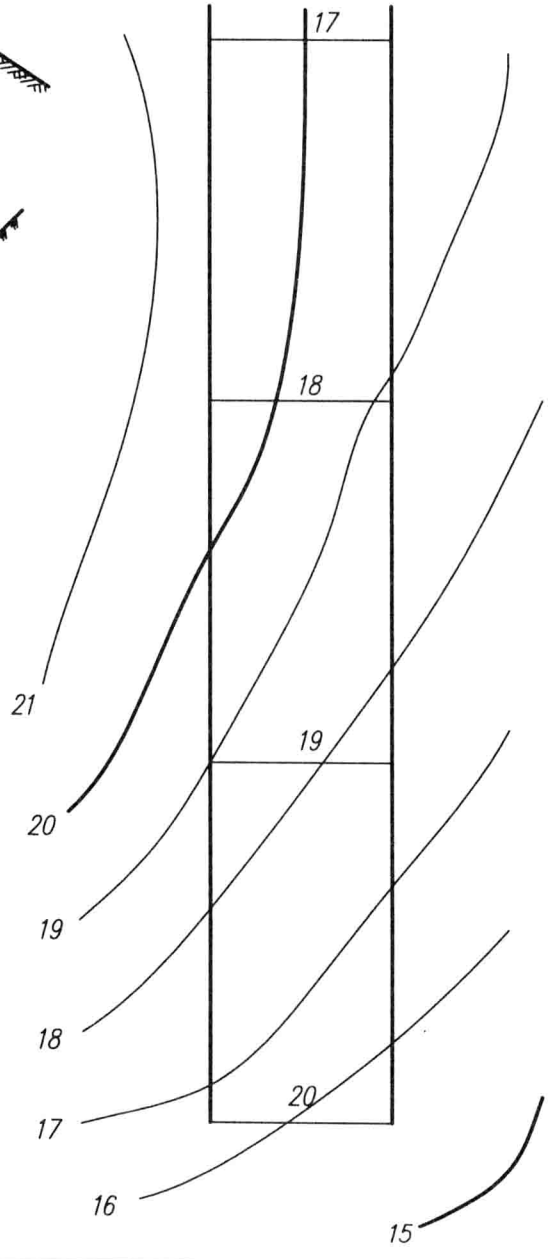
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9-17 修筑图示标准断面的斜道，填、挖方边坡图上已示，求作开挖线和坡脚线。(1：500)





道路标准断面



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第3章　投影变换

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第5章　曲面立体的投影
第6章　组合体视图
第7章　剖面图和断面图
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